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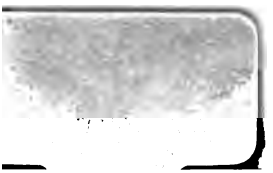

PRACTICAL ARITHMETIC

FOR SCHOOLS.

BY

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EDINBURGH.

FOURTH EDITION.

LONDON: SIMPKIN, MARSHALL, & CO.
EDINBURGH: J. MENZIES & CO. & W. A. MILLER.

1881.

181. g. 212.

Published Separately,

Exercise Tables in Elementary Arithmetic for Drilling Classes Simultaneously. Price 1½d.

EDINBURGH:
PRINTED BY H. AND J. PILLANS,
12 THISTLE STREET.

PREFACE.

THE "PRACTICAL ARITHMETIC" is designed to supply a text-book in which vulgar fractions are introduced at a much earlier stage than usual. This is accomplished by a series of easy initiatory exercises suited to the attainments of the pupil. The difficulties which present themselves in the study of the compound rules, and even in some parts of the simple rules, as in division by factors, fractional multipliers, and divisors, &c., are thus not only overcome, but are found to afford scope for the continued revisal and application of the principles already studied, as well as to prepare the minds of the pupils for the better understanding of the more difficult exercises that follow. All discussion of theoretical principles, which can be best taught by the master in his own way, has been avoided, but lists of "Terms requiring to be Explained" have been introduced, which it is hoped may be found useful to the teacher, and afford assistance to the pupils in remembering the instructions they receive. A few explanatory notes

and fully wrought-out examples have also been added where necessary.

In Mental Arithmetic, varied examples of exercises suited to the several stages of advancement are given; and only those rules are stated which are really useful and easily remembered.

To a few of the examples at the beginning of each new set of exercises the answers have been appended, which will often be found a source of instruction and encouragement to the pupil. The other answers and solutions of a few of the more difficult problems will be found in the key. Care has been taken to give the historical dates introduced into some of the questions, and which refer only to important events, in chronological order.

The exercise tables, which should be used daily in combination with the ordinary slate work, will be found of great value in drilling classes simultaneously, and as affording an interesting and useful method of securing accuracy and expertness.

EDINBURGH, 13*th September* 1873.

CONTENTS.

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	PAGE
TABLE I. Initiatory Exercises in Numeration	7
II. Initiatory Exercises in Addition	8
III. Initiatory Exercises in Subtraction	9
IV. Exercises on the Multiplication Table	10
V. Initiatory Exercises in Division	11–12
VI. Table of Figures for Longer Exercises	13
ADDITION TABLE	14
SUBTRACTION TABLE	14
MULTIPLICATION TABLE	15
NUMERATION	16
NOTATION	17
ROMAN NUMERALS	19
ADDITION	21
VULGAR FRACTIONS	26
SUBTRACTION	27
VULGAR FRACTIONS (*continued*)	31
MULTIPLICATION	32
DIVISION	38
VULGAR FRACTIONS (*continued*)	39
MISCELLANEOUS EXERCISES	48
COMPOUND RULES (*Money*)	57
Reduction	58
Compound Addition	61
Compound Subtraction	67
Compound Multiplication	70
Compound Division	74
VULGAR FRACTIONS (*continued*)	79
PRACTICE	82
INVOICES OR BILLS OF PARCELS	85
RATIO	87

PAGE

PROPORTION 88
RULE OF THREE 90
COMPOUND RULE OF THREE 92
MISCELLANEOUS EXERCISES 94
COMPOUND RULES 101
Avoirdupois Weight 101
Troy Weight 105
Apothecaries' Weight 107
Liquid Measure 108
Dry Measure 110
Apothecaries' Fluid Measure 111
Lineal Measure 111
Cloth Measure 114
Square Measure 116
Cubic Measure 119
Angular Measure 122
Time 122
PRIME FACTORS 123
GREATEST COMMON MEASURE 124
LEAST COMMON MULTIPLE 125
VULGAR FRACTIONS (*continued*) 126
MISCELLANEOUS EXERCISES 127
DECIMAL FRACTIONS 135
METRIC SYSTEM 145
PERCENTAGES 154
Commission—Brokerage—Insurance . . . 156
Interest 157
Profit and Loss 164
Proportional Parts 165
Stocks 168
Chain Rule and Exchange 170
ROOTS 172
MENSURATION 172
MISCELLANEOUS EXERCISES 174
ARITHMETICAL TABLES 182
THE METRIC SYSTEM 187
ANSWERS

PRACTICAL ARITHMETIC.

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TABLE I.

Initiatory Exercises in Numeration.

	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	V	W	X	Y
I.	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
II.	1	0	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
III.	9	0	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
IV.	8,	9	1	7	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,	3,
V.	9	0,	0	6	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
VI.	7	6	1,	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
VII.	8,	0	9	6	0	1	9	5,	5,	5,	5,	5,	5,	5,	5,	5,	5,	5,	5,	5,	5,	5,	5,
VIII.	1	6,	7	8	1	9	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
IX.	7	4	3,	0	0	9	8	7	0	9	9	9	9	9	9	9	9	9	9	9	9	9	9
X.	3	2	1	1,	1	8	3	8	1	1	7	7	7	7	7	7	7	7	7	7	7	7	7
XI.	1	0	0	0	9,	6	0	0	8	0	7	6	6	6	6	6	6	6	6	6	6	6	6
XII.	4	3	6	0	7	4,	3	0	6	9	0	7	8	8	8	8	8	8	8	8	8	8	8
XIII.	1,	5	8	9	6	7	6,	1	9	8	7	6	8	1,	1,	1,	1,	1,	1,	1,	1,	1,	1,
XIV.	4	1,	9	8	1	3	2	4,	7	6	0	0	9	6	6	6	6	6	6	6	6	6	6
XV.	5	3	2,	7	6	1	3	0	0,	0	9	0	6	1	3	5	5	5	5	5	5	5	5
XVI.	9	7	0	0,	6	0	0	1	0	0,	9	0	0	6	0	8	4	4	4	4	4	4	4
XVII.	8	0	6	0	9,	0	6	0	7	0	8,	0	7	0	5	0	1	8	8	8	8	8	8
XVIII.	4	1	3	0	6	9,	8	3	6	7	0	0,	9	0	0	6	0	0	3	3	3	3	3
XIX.	1,	9	8	0	0	0	0,	6	0	0	0	0	7,	0	0	0	0	8	7	2,	2,	2,	2,
XX.	5	4,	1	9	6	0	9	7,	8	3	0	7	5	4,	0	8	3	2	1	5	1	1	1
XXI.	6	1	3,	8	7	1	9	8	3,	9	1	6	0	0	0,	0	8	3	2	1	9	7	7
XXII.	1	4	5	6,	0	0	9	6	7	3,	2	1	4	1	5	8,	9	6	8	3	2	1	5
XXIII.	2	1	9	7	6,	8	4	1	5	8	9,	6	5	4	2	3	1,	2	4	5	8	7	6

Note.—The Roman numerals and letters are for convenience of reference to the several lines.

TABLE II.

Initiatory Exercises in Addition.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
A	1	2	3	1	1	2	3	2	3
	1	2	1	3	2	3	2	1	3
B	4	1	4	6	5	3	2	6	5
	3	4	2	3	1	4	6	1	3
C	3	1	6	3	4	1	5	2	5
	6	5	2	5	1	6	2	5	5
D	6	4	4	5	6	4	5	4	6
	5	4	5	6	4	6	4	4	6
E	3	7	2	9	8	9	3	8	9
	8	2	8	3	2	1	9	1	2
F	1	7	7	1	3	2	8	2	1
	7	1	3	8	7	9	3	7	9
G	7	8	5	6	4	7	8	4	5
	6	6	7	8	9	4	5	7	9
H	8	9	9	7	4	6	5	9	8
	4	6	4	5	8	9	8	5	9
J	7	8	7	6	9	8	9	9	7
	9	7	8	7	8	8	9	7	7

Note.—This table contains all the combinations of the nine digits, and may be used either horizontally from the right or left, or vertically from the top or bottom of the line. Every pair of figures are to be added separately; thus line A from the left, 2, 4, 4, &c.; line VI. from the top, 5, 7, 7, 10, &c.

TABLE III.

Initiatory Exercises in Subtraction.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
A	1	4	3	2	2	7	7	9	5
	1	1	2	2	1	2	1	2	1
B	4	3	6	8	9	8	6	5	3
	2	1	2	1	1	2	1	2	3
C	5	6	7	9	9	4	4	8	8
	3	4	3	3	4	4	3	4	3
D	6	5	7	5	7	6	9	8	8
	3	4	4	5	5	6	6	5	6
E	9	7	6	7	9	8	8	9	9
	5	6	5	7	7	8	7	9	8
F	10	11	10	12	11	11	12	10	13
	1	2	2	3	4	3	4	3	4
G	10	11	14	13	14	12	15	13	10
	4	5	5	5	6	5	6	6	5
H	12	11	10	14	10	11	15	12	15
	6	7	6	7	7	6	7	7	8
J	16	13	12	11	10	17	16	12	13
	7	7	8	9	8	8	9	9	8
K	14	14	18	16	15	11	10	17	13
	8	9	9	8	9	8	9	9	9

Note.—This table contains all the combinations that occur in Practice, and may be used either horizontally or vertically, as in the preceding table. The answers are to be read off as follows:—Line D from the left, 3, 1, 3, 0, &c.; line VII. from the bottom, 1, 7, 8, 9, &c.

TABLE IV.

Exercises on the Multiplication Table.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
A	5	9	3	1	12	10	11	8	7	2	4	6
B	6	3	2	7	4	1	5	12	11	9	8	10
C	7	12	6	8	2	5	9	3	1	10	4	11
D	8	7	10	1	6	5	2	9	3	11	4	12
E	3	4	5	2	8	7	6	10	9	1	11	12
F	9	1	7	10	6	5	12	2	3	8	4	11
G	12	1	4	11	3	2	9	10	5	8	7	6
H	3	4	12	2	1	11	10	8	9	5	6	7
J	8	7	12	9	11	10	6	8	7	5	9	6
K	12	6	8	9	12	5	9	7	11	6	10	7
L	11	9	7	12	11	8	10	7	6	11	12	9
M	8	10	12	9	7	5	6	8	7	10	11	8

Note.—In using the above table, the pupil or class should be requested to multiply the figures in any of the lines by one of the first twelve numbers—thus, line G from the left by 9; 108, 9, 36, &c.; line M from the right by 12; 96, 132, 120, &c.

TABLE V.

Initiatory Exercises in Division.

		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.	XX.	
2		7	3	8	5	6	2	10	4	11	9	12	19	14	18	13	16	15	17	13	19	
3	A	4	12	5	11	10	3	7	9	6	8	14	13	17	18	15	19	16	20	22	27	A
„	B	29	21	23	26	25	24	28	13	25	29	24	27	13	15	16	18	24	26	11	16	B
4	A	9	10	5	4	7	6	8	21	11	12	14	13	17	16	15	18	19	20	25	24	A
„	B	26	30	23	28	22	29	27	31	35	33	32	36	38	34	37	39	22	19	24	26	B
5	A	10	13	6	12	11	5	9	8	7	14	18	15	20	19	16	21	17	22	23	28	A
„	B	30	27	29	31	24	32	26	35	33	25	34	38	36	37	39	35	24	26	27	28	B
„	C	48	36	41	49	40	35	13	29	42	18	43	47	30	11	29	44	29	31	45	46	C
6	A	12	21	16	13	10	18	11	24	8	20	7	17	25	23	14	9	15	19	6	22	A
„	B	32	36	35	41	31	45	27	40	34	39	26	44	30	33	28	38	42	29	37	43	B
„	C	49	59	48	57	54	47	56	50	53	35	46	58	52	27	51	39	55	29	19	49	C
7	A	16	25	8	15	12	17	10	24	18	23	19	11	9	14	21	7	22	13	26	20	A
„	B	31	37	30	36	28	29	27	41	35	46	32	45	42	33	38	44	34	39	43	40	B
„	C	47	60	51	59	50	58	61	57	49	63	52	56	62	55	53	66	64	54	65	48	C
8	A	12	22	20	11	29	21	13	28	18	23	19	10	27	17	24	14	26	25	15	16	A
„	B	30	35	34	40	44	33	41	49	43	32	48	36	42	45	37	39	46	38	47	31	B
„	C	55	62	65	51	54	61	50	60	53	59	66	52	69	58	64	57	68	63	67	56	C
„	D	77	61	71	76	63	70	41	75	78	54	39	79	25	74	13	29	73	37	42	72	D
		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.	XX.	

Initiatory Exercises in Division—(*continued*).

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.	XX.	
9 A	11	21	16	28	19	24	27	10	15	9	18	23	14	17	20	25	13	22	26	12	A
„ B	29	33	40	32	39	31	38	42	34	41	30	44	25	43	46	36	48	37	47	45	B
„ C	49	56	55	61	52	64	67	51	60	66	54	59	63	68	58	65	53	62	57	50	C
„ D	71	70	75	78	69	80	83	74	89	77	73	86	87	76	85	81	82	84	79	72	D
10	90	89	63	55	17	74	42	71	11	73	13	66	43	19	74	36	85	99	22	95	
11 A	14	20	25	13	22	19	12	21	24	29	23	18	11	27	17	28	16	26	30	15	A
„ B	31	38	45	37	44	46	36	43	49	35	42	34	50	33	48	40	41	39	47	32	B
„ C	55	65	60	64	54	63	68	53	62	70	52	69	61	51	57	66	59	67	58	56	C
„ D	71	77	82	86	72	78	83	87	90	73	79	84	88	74	80	75	85	89	76	81	D
„ E	91	95	103	94	97	99	102	106	59	93	101	105	96	98	100	108	107	109	104	92	E
12 A	13	16	24	21	23	30	15	28	18	22	20	25	27	14	29	26	12	17	31	19	A
„ B	32	34	36	41	45	51	44	38	49	43	48	39	46	50	47	40	42	37	35	33	B
„ C	54	61	67	53	60	63	59	52	66	55	65	62	58	69	56	64	71	68	70	57	C
„ D	72	77	81	88	87	91	82	90	73	76	83	79	86	84	74	78	89	80	85	75	D
„ E	93	95	103	94	102	107	101	92	106	96	110	100	108	97	104	98	109	99	105	111	E
„ F	112	118	66	115	99	117	114	65	73	113	119	69	71	47	116	78	68	35	19	75	F
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.	XX.	

Note.—The above table contains all the combinations that occur in dividing by any number from 2 to 12 inclusive, with the exception of 10. The divisors are printed in bold type on the left. The answers may be read off as follows:—Line C by 8; 6 and 7, 7 and 6, 8 and 1, &c.; line F by 12; 9 and 4, 9 and 10, 5 and 6, &c.

TABLE VI.—Table of Figures for Longer Exercises.

	83	85	78	66	73	86	72	68	72	57	64	76	77	65	70	72	78	75	61	69	68	
	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	V	W	
I.	8	9	7	6	5	8	4	3	9	2	8	7	5	6	4	3	9	2	7	8	6	I. 126
II.	4	7	9	5	8	3	9	2	7	8	4	5	9	8	3	2	9	8	4	6	3	II. 123
III.	9	8	9	6	4	7	6	9	8	3	2	1	4	9	6	7	8	9	5	4	8	III. 132
IV.	7	5	8	2	9	6	3	7	7	4	5	6	9	3	2	1	4	9	8	7	6	IV. 118
V.	5	8	7	6	4	8	9	3	2	1	9	8	4	5	6	7	9	8	7	5	4	V. 125
VI.	3	9	6	5	5	9	8	7	6	8	7	5	3	2	9	8	3	4	2	7	6	VI. 122
VII.	9	6	4	9	5	6	7	8	9	7	4	5	6	4	9	8	7	6	4	5	8	VII. 136
VIII.	9	5	6	4	9	8	3	6	4	5	8	9	7	6	5	8	9	7	5	3	2	VIII. 128
IX.	8	4	7	6	9	8	6	5	3	4	2	7	6	5	8	9	3	2	4	7	9	IX. 122
X.	6	9	5	4	2	8	3	7	6	4	5	8	9	6	7	8	6	5	3	2	8	X. 121
XI.	9	7	6	4	8	9	7	3	2	8	4	6	7	5	4	7	5	6	4	8	3	XI. 122
XII.	6	8	4	9	5	6	7	8	9	3	6	9	8	6	7	4	6	9	8	7	5	XII. 140
	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	V	W	
9	2	3	5	4	2	3	9	5	8	4	2	4	4	2	8	0	6	1	8	5	8	

NOTE.—The figures may be added either vertically or horizontally. Every pair of lines forms an exercise in Subtraction, as indicated by the brackets on the right. Any line may be multiplied or divided by any of the first twelve numbers. The sums of the figures in each vertical line are printed along the top, the sum of those in each horizontal line down the side, and the answer to the whole taken as an ordinary exercise in addition at the bottom.

ADDITION TABLE.

1 and	2 and	3 and	4 and	5 and	6 and	7 and	8 and	9 and	10 and	11 and	12 and
1 are 2	1 are 3	1 are 4	1 are 5	1 are 6	1 are 7	1 are 8	1 are 9	1 are 10	1 are 11	1 are 12	1 are 13
2 - 3	2 - 4	2 - 5	2 - 6	2 - 7	2 - 8	2 - 9	2 - 10	2 - 11	2 - 12	2 - 13	2 - 14
3 - 4	3 - 5	3 - 6	3 - 7	3 - 8	3 - 9	3 - 10	3 - 11	3 - 12	3 - 13	3 - 14	3 - 15
4 - 5	4 - 6	4 - 7	4 - 8	4 - 9	4 - 10	4 - 11	4 - 12	4 - 13	4 - 14	4 - 15	4 - 16
5 - 6	5 - 7	5 - 8	5 - 9	5 - 10	5 - 11	5 - 12	5 - 13	5 - 14	5 - 15	5 - 16	5 - 17
6 - 7	6 - 8	6 - 9	6 - 10	6 - 11	6 - 12	6 - 13	6 - 14	6 - 15	6 - 16	6 - 17	6 - 18
7 - 8	7 - 9	7 - 10	7 - 11	7 - 12	7 - 13	7 - 14	7 - 15	7 - 16	7 - 17	7 - 18	7 - 19
8 - 9	8 - 10	8 - 11	8 - 12	8 - 13	8 - 14	8 - 15	8 - 16	8 - 17	8 - 18	8 - 19	8 - 20
9 - 10	9 - 11	9 - 12	9 - 13	9 - 14	9 - 15	9 - 16	9 - 17	9 - 18	9 - 19	9 - 20	9 - 21
10 - 11	10 - 12	10 - 13	10 - 14	10 - 15	10 - 16	10 - 17	10 - 18	10 - 19	10 - 20	10 - 21	10 - 22
11 - 12	11 - 13	11 - 14	11 - 15	11 - 16	11 - 17	11 - 18	11 - 19	11 - 20	11 - 21	11 - 22	11 - 23
12 - 13	12 - 14	12 - 15	12 - 16	12 - 17	12 - 18	12 - 19	12 - 20	12 - 21	12 - 22	12 - 23	12 - 24

SUBTRACTION TABLE.

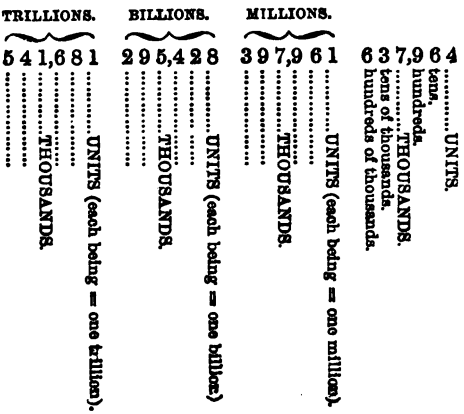
1 from	2 from	3 from	4 from	5 from	6 from	7 from	8 from	9 from
2 leaves 1	3 leaves 1	4 leaves 1	5 leaves 1	6 leaves 1	7 leaves 1	8 leaves 1	9 leaves 1	10 leaves 1
3 ... 2	4 ... 2	5 ... 2	6 ... 2	7 ... 2	8 ... 2	9 ... 2	10 ... 2	11 ... 2
4 ... 3	5 ... 3	6 ... 3	7 ... 3	8 ... 3	9 ... 3	10 ... 3	11 ... 3	12 ... 3
5 ... 4	6 ... 4	7 ... 4	8 ... 4	9 ... 4	10 ... 4	11 ... 4	12 ... 4	13 ... 4
6 ... 5	7 ... 5	8 ... 5	9 ... 5	10 ... 5	11 ... 5	12 ... 5	13 ... 5	14 ... 5
7 ... 6	8 ... 6	9 ... 6	10 ... 6	11 ... 6	12 ... 6	13 ... 6	14 ... 6	15 ... 6
8 ... 7	9 ... 7	10 ... 7	11 ... 7	12 ... 7	13 ... 7	14 ... 7	15 ... 7	16 ... 7
9 ... 8	10 ... 8	11 ... 8	12 ... 8	13 ... 8	14 ... 8	15 ... 8	16 ... 8	17 ... 8
10 ... 9	11 ... 9	12 ... 9	13 ... 9	14 ... 9	15 ... 9	16 ... 9	17 ... 9	18 ... 9

MULTIPLICATION TABLE.

2 times	3 times	4 times	5 times	6 times	7 times	8 times	9 times	10 times	11 times	12 times
1 are 2	1 are 3	1 are 4	1 are 5	1 are 6	1 are 7	1 are 8	1 are 9	1 are 10	1 are 11	1 are 12
2 ... 4	2 ... 6	2 ... 8	2 ... 10	2 ... 12	2 ... 14	2 ... 16	2 ... 18	2 ... 20	2 ... 22	2 ... 24
3 ... 6	3 ... 9	3 ... 12	3 ... 15	3 ... 18	3 ... 21	3 ... 24	3 ... 27	3 ... 30	3 ... 33	3 ... 36
4 ... 8	4 ... 12	4 ... 16	4 ... 20	4 ... 24	4 ... 28	4 ... 32	4 ... 36	4 ... 40	4 ... 44	4 ... 48
5 ... 10	5 ... 15	5 ... 20	5 ... 25	5 ... 30	5 ... 35	5 ... 40	5 ... 45	5 ... 50	5 ... 55	5 ... 60
6 ... 12	6 ... 18	6 ... 24	6 ... 30	6 ... 36	6 ... 42	6 ... 48	6 ... 54	6 ... 60	6 ... 66	6 ... 72
7 ... 14	7 ... 21	7 ... 28	7 ... 35	7 ... 42	7 ... 49	7 ... 56	7 ... 63	7 ... 70	7 ... 77	7 ... 84
8 ... 16	8 ... 24	8 ... 32	8 ... 40	8 ... 48	8 ... 56	8 ... 64	8 ... 72	8 ... 80	8 ... 88	8 ... 96
9 ... 18	9 ... 27	9 ... 36	9 ... 45	9 ... 54	9 ... 63	9 ... 72	9 ... 81	9 ... 90	9 ... 99	9 ... 108
10 ... 20	10 ... 30	10 ... 40	10 ... 50	10 ... 60	10 ... 70	10 ... 80	10 ... 90	10 ... 100	10 ... 110	10 ... 120
11 ... 22	11 ... 33	11 ... 44	11 ... 55	11 ... 66	11 ... 77	11 ... 88	11 ... 99	11 ... 110	11 ... 121	11 ... 132
12 ... 24	12 ... 36	12 ... 48	12 ... 60	12 ... 72	12 ... 84	12 ... 96	12 ... 108	12 ... 120	12 ... 132	12 ... 144

The above may also bo conveniently used as a division table.

NUMERATION TABLE.



NUMERATION.

Terms to be explained:—*Arithmetic—number—unit—digits—cypher or zero—numeration and notation—signs of equality and addition.*

I.

Express the following numbers in *words*:—

(1.) 8, 6, 4, 7, 5, 9, 3, 0, 1, 2, 10, 17, 11, 19.
(2.) 30, 29, 45, 83, 64, 79, 90, 47, 81, 30, 13.
(3.) 672, 409, 892, 465, 700, 608, 111, 911, 101.
(4.) 302, 645, 982, 289, 829, 745, 999, 909, 919.
(5.) 6010, 8009, 6450, 7060, 8945, 7777, 7077, 7007.
(6.) 89604, 60032, 74580, 10010, 54321, 50321, 50021.
(7.) 648983, 601003, 896010, 896415, 707009, 770090.
(8.) 748611, 954321, 865400, 681110, 600006, 500015.
(9.) 65489675, 4100893, 754896432, 807006050.

(10.) 10009600, 8645142, 1234567890, 845698921145, 6895489640415.

The number $364 = 300 + 60 + 4$.

„ $69809 = 60000 + 9000 + 800 + 9$.

Analyse in a similar manner :—

(11.) 724, 896, 740, 609.

(12.) 8072, 6909, 8006, 7832.

(13.) 96843, 78960, 60096, 83001.

(14.) 876101, 907810, 300618, 3800113.

Express as one number :—

(15.) $30 + 4$, $900 + 8$, $800 + 60 + 3$, $700 + 80$.

(16.) $8000 + 90 + 6$, $9000 + 700 + 8$.

(17.) $90000 + 1000 + 800 + 60 + 9$, $110000 + 7000 + 70 + 8$.

NOTATION.

II.

Express the following numbers *in figures* :—

(1.) Five, six, nine, eight, four, three, two, one, seven.

(2.) Forty-two, eighty-nine, fifty-five, sixty-seven, thirty, twenty-one.

(3.) Five hundred and sixty-three, nine hundred and eleven, seven hundred and eighty-four, one thousand one hundred and forty.

(4.) Seven hundred and eighty-two, nine hundred and nine, four hundred and seventy-four, two-hundred and one, three hundred and eighty nine.

(5.) Five thousand six hundred and nine, six thousand three hundred and eleven, one thousand four hundred and nineteen, six thousand four hundred, five thousand and eighty.

(6.) Seventy-four thousand and one, eighty-six thousand and ninety, sixty-one thousand five hundred, fifty thousand and fifty, sixty-one thousand eight hundred and nine, nine thousand and nine.

(7.) Five hundred and forty thousand, six hundred thousand and forty-three, seventy-five thousand and

sixty, eighty thousand and eighty-eight, two hundred thousand and twenty-one.

(8.) Three millions and three, two millions and twenty, seventy-five millions and sixty-four, six hundred and twenty-nine millions sixty-one thousand and eight, seven hundred and eighty-four millions three hundred and forty-five thousand two hundred and eighty-two.

(9.) Five hundred thousand eight hundred and sixty-four millions two hundred and fifty thousand five hundred and nine, eight hundred and sixty-one thousand three hundred and forty-four millions five hundred and ninety-five thousand one hundred and one, four billions sixty-four millions eight thousand and seventy.

(10.) Nineteen billions eighteen millions seventeen thousand and fifteen, seventy-one billions five hundred and five millions sixty thousand and seven, thirty-five billions seven thousand and nineteen millions four thousand five hundred and eleven, six hundred and forty-three billions two hundred and forty-two thousand three hundred and seventy-five millions eight hundred and nine thousand five hundred and seventy-two.

III.

(1.) What is the smallest number which can be expressed by three figures? what is the largest?

(2.) What is the smallest number which can be expressed by six figures? what is the largest?

(3.) What is a thousand thousands called? what, a million millions?

(4.) Read the heights of the following mountains:—Ben Nevis, 4406 feet; Mt. Blanc, 15744 feet; Mt. Everest, the highest in the Himalaya range, 29000 feet; Mt. Hood, the highest in N. America, 18000 feet; Aconcaqua, the highest of the Andes, 23910 feet.

(5.) Read the following areas:—England, 58000 sq. miles; Scotland, 31000 sq. miles; Ireland, 33000 sq. miles; British Empire, 8600000 sq. miles; land surface of the globe, 51500000 sq. miles.

(6.) Express the following numbers in figures:—the Caucasian race consists of five hundred millions; the Mongolian, of four hundred and ninety millions; the Negro, of one hundred millions; the Malay, of sixty-eight millions; the American Indian, of sixteen millions; the population of the globe, of one thousand two hundred and fifteen millions.

(7.) Express the following numbers in figures:—the distance of the planet Mercury from the sun is thirty-five millions six hundred and forty-nine thousand miles; of Venus, sixty-six millions six hundred and fourteen thousand miles; of the earth, ninety-two millions and ninety-three thousand miles; of Mars, one hundred and forty millions three hundred and twenty-two thousand miles; of Jupiter, four hundred and seventy-nine millions one hundred and forty-one thousand miles.

(8.) The distance of Uranus from the sun is one thousand seven hundred and sixty-six millions five hundred and sixty-five thousand miles; of Neptune, two-thousand seven hundred and sixty-six millions one hundred and thirty-three thousand miles.

(9.) The distance of the nearest fixed star from the earth is twenty-one billions of miles.

(10.) A star of the 16th magnitude is supposed to be thirty-three thousand nine hundred and eight billions of miles distant.

ROMAN NUMERALS.

I. = 1, II. = 2, III. = 3, IV. = 4, V. = 5, VI. = 6, VII. = 7, VIII. = 8, IX. = 9, X. = 10, L. = 50, C. = 100, D. or I$\supset$. = 500, M. or CI$\supset$. = 1000, CCCC. or CD. = 400, CM. = 900.

A letter placed before another of greater value is subtracted from it, as IV. = 4, but after one of equal or greater value is added, as XX. = 20, XI. = 11.

A line over a letter increases its value a thousandfold, as $\overline{\text{V}} = 5000$.

IV.

(1.) *Read*—V., VII., IV., VI., X., IX., XI., VIII., XII., I., III., II.

(2.) C., XC., CX., CL., CXX., CCIX., CCXIX., XL., LVIII., LXXII.

(3.) MD., MCCCC., $\overline{\text{D}}$., $\overline{\text{C}}$., MDCCXL., MDCLXXIX., MDCCCLXXII.

(4.) Express in *Roman numerals*:—3, 6, 9, 10, 11, 12, 18, 17, 16, 19, 21.

(5.) 36, 43, 75, 84, 97, 204, 506, 829, 1450, 1873.

(6.) Express the following dates in *Roman numerals*:—Grecian History—Homer lived 850 B.C. First Olympiad, 776 B.C. Battle of Marathon, 490 B.C. Athenian supremacy, 449 B.C.

(7.) Capture of Athens by Spartans, 404 B.C. Retreat of the "ten thousand," 400 B.C. Aristotle flourished, 366 B.C. Philip became king of Macedon, 359 B.C. Greece conquered by the Romans, 146 B.C.

(8.) Roman History—Rome founded, 753 B.C. End of kingdom, 509 B.C. Julius Cæsar born, 100 B.C. End of Republic, 30 B.C. Christianity established at Rome, 324 A.D. Fall of Empire, 470 A.D.

(9) History of the Middle ages—Birth of Mohammed, 571 A.D. Charlemagne becomes Emperor of the West, 800 A.D. Arabic numerals introduced into Europe, 991 A.D. First Crusade, 1096 A.D.; end of the Crusades, 1291 A.D. Swiss independence, 1307 A.D. Columbus discovered America, 1492 A.D.

(10.) Heptarchy completed in England, 582 A.D. Monarchy established in England, 827 A.D. Battle of Hastings, 1066 A.D. Henry II, first of the Plantagenet line, ascended the throne, 1154 A.D. House of Commons first summoned, 1265 A.D. Battle of Bannockburn, 1314 A.D. Henry IV., first of the Lancastrian line, 1399 A.D. Edward IV., first of the House of York, 1461 A.D. Henry VII., first of the Tudor line, 1485 A.D.

ADDITION.

Sign +, PLUS. Terms to be explained :—*Addition—plus—sum.*

MENTAL EXERCISES.

a. 2 + 2 + 2 &c. 3 + 3 + 3 &c. 4 + 4 + 4 &c., and so with the other numerals.

b. 3 + 4 + 6 + 7 &c.

c. What two numbers added together are equal to 5? to 10? to 18? to 21? &c. What three numbers added together are equal to 12? to 25? to 48? &c.

d. 12 + 13 + 15 + 17 &c.; and similar exercises.

V.

(1.)	(2.)	(3.)	(4.)	(5.)
24	46	24	87	89
63	23	65	65	21
12	30	42	46	43
—	—	—	—	—
Ans. 99				

(6.)	(7.)	(8.)
346	964	509
287	876	832
163	807	697
—	—	—
Ans. 796		

(9.)	(10.)
1234567890123	6458968321078
9876543210987	7632145468976
—	—
(11.)	(12.)
8321458376548	9876543210987
6483583600697	8765432109876
	7654321012345
—	—
(13.)	(14.)
4321483214568	9832146954814
4814396842146	8765149843249
1489768329851	7641498695104
—	—

(15.)	(16.)	(17.)	(18.)
8496	9458	9764	7614
1983	3214	3895	832
2069	6958	649	1496
7543	7689	8914	974
8762	3846	96	843
—	—	—	—

(19.)
56842
61945
83646
76214
89636
96848

(20.)
64893
14976
8643
96415
693
84219

(21.)
36
469
8948
64159
6983
21496

(22.)
369
4831
89764
1569
832
48

(23.)
76489
64198
61549
86189
8964
96413

(24.)
68974
87609
90986
1498
36145
89674

(25.)
398147
689423
867639
149869
684514
895461

(26.)
965489
681987
964932
149863
648321
497649

(27.)
614968
49837
148614
969421
84976
4835

(28.)
964158
96483
614832
19614
832149
6838
48190

(29.)
7648954832
8417694946
9764589769
3814954832
1476145614
9765489784
8497654832

(30.)
8456798349
7641321486
4583214968
7694329849
6749832186
986497698
4983146954

(31.) 2496 + 4893 + 1496 + 8954 + 8932 + 9784.

(32.) 489 + 2468 + 9654 + 96 + 89645. (*Ans.* 102352.)

(33.) 67894 + 9870 + 83214 + 67894 + 8965.

(34.) 29 + 8475 + 896 + 98 + 473 + 8960 + 89.

(35.) 5896 + 4889 + 7777 + 55555 + 4498 + 89646.

(36.) 98456 + 94396 + 8949 + 67432 + 65834 + 9988 + 77689 + 98432.

(37.) 84984 + 9006 + 9873 + 89476 + 83214 + 67452 + 8337 + 98462.

(38.) 86 + 98456 + 8974 + 963 + 98 + 76 + 83214 + 968432.

(39.) 896498 + 832896 + 489765 + 674514 + 809748 + 830960.

(40.) 849832 + 670983 + 483214 + 976589 + 89009 + 684583 + 98321 + 89649.

(41.) 7648946 + 8964583 + 9764821 + 8954972 + 974583 + 9768498 + 9845679.

(42.) 6849568 + 9424568 + 8321496 + 4983214 + 896706 + 8494839 + 476542 + 7643.

(43.) 87654831 + 98648954 + 9864896 + 97654839 + 68419698 + 896489.

(44.) 764832 + 97684 + 893421 + 897 + 456896 + 976894 + 764396 + 789.

(45.) 489764 + 983219 + 876489 + 674832 + 896489 + 6745 + 896 + 49.

(46.) 43 + 896 + 6749 + 89 + 960 + 19 + 6742 + 89684 + 9 + 89642.

(47.) 896 + 408 + 6009 + 674 + 896 + 9745 + 89632 + 67456 + 96.

(48.) 96 + 894 + 6742 + 89583 + 694 + 867456 + 983249 + 6745897 + 64832 + 674.

(49.) 8645897694 + 8963248956 + 9832146836 + 648932149 + 6789456896 + 9765489786 + 8976983214 + 8321496589 + 6414897693 + 9768964197.

(50.) 8321498321 + 6849870609 + 8329867498 + 7654983218 + 4956976839 + 6798493896 + 8764897654 + 8987695483 + 7648976983 + 9764058972.

Add together—

(51.) Eight hundred and ninety-six thousand four hundred and nine, four hundred and seventy-eight thousand five hundred and fourteen, six hundred and twenty-six thousand three hundred and ninety-two, six thousand five hundred and seventy-three, thirty-six thousand four hundred and fifty, seventy-nine thousand five hundred and eighty-seven.—*Ans.* 2123925.

(52.) Six hundred and eighty-four thousand four hundred and ninety-six, four hundred and seventy-six thousand three hundred and seventy-nine, seven hundred and nine thousand four hundred and seventy-two, four hundred and seven, fifty-one thousand six hundred and thirty-four, eight thousand six hundred and seventy-nine.

(53.) Five hundred and ninety-eight, six hundred and seventy-one thousand and eight, seven thousand six hundred and eighty-four, four hundred and ninety-six thousand five hundred and thirty-four, seven hundred and eighty-nine, forty-six thousand three hundred and sixty-nine.

(54.) Eight thousand five hundred and ninety-nine, six hundred and seventy-six thousand two hundred and thirty-four, forty-nine thousand six hundred and eighty-seven, five hundred and forty-seven thousand six hundred and eighty, sixty-seven thousand five hundred and nine, eight hundred and eighty-nine thousand five hundred and sixty-seven.

(55.) Nine hundred and seventy-six thousand five hundred and forty-one, eighty-seven thousand two hundred and eighty-four, five hundred and sixty-one thousand four hundred and twenty-seven, four thousand nine hundred and eighty-nine, seven hundred and sixty-nine thousand four hundred and seventy-nine, seven hundred and eighty-four thousand eight hundred and six.

(56.) Two thousand four hundred and fifty-five, six hundred and seventy-six thousand two hundred and ninety-seven, four hundred and eighty-four thousand five hundred and seventy-nine, seven hundred and eighty-two, sixty-three thousand nine hundred, four hundred and ninety-one thousand five hundred and seventy-two.

(57.) Nine millions eight hundred and forty-nine thousand five hundred and eighty-four, five millions seven hundred and sixty-one thousand eight hundred and ninety-nine, two millions five hundred and sixty-four thousand three hundred and fifty-four, seven hundred and eighty-four thousand seven hundred and ninety-seven, nineteen millions nine thousand and eighteen, four millions five hundred and sixty-four thousand three hundred and ninety-four.

(58.) Four millions six hundred and eighty-four thousand seven hundred and ninety-nine, six hundred and forty-one thousand five hundred and seventy-six, forty-two thousand six hundred, eight hundred, nine millions four hundred and seventy-six thousand five hundred and eighty-four, eleven.

(59.) Four hundred and fifty-nine millions eight hundred and seven thousand and nine, one thousand and fifty-four millions ninety-eight thousand and forty-two, six hundred and nine millions eighty thousand and nine, forty-nine millions fifty-six thousand and forty-one, seven hundred and six millions eight hundred and nine thousand four hundred and eleven, sixty-four millions seven hundred and twelve thousand eight hundred and nineteen, six hundred and forty-two millions five hundred and sixty-nine thousand nine hundred and eighty-one.

(60.) Eight hundred and ninety-eight millions nine hundred and forty-six thousand five hundred and sixty-nine, seventy-six thousand five hundred and forty-seven, forty-two millions five hundred and sixty-seven thousand four hundred and eighty-nine, six hundred and forty-eight, five thousand four hundred and eighty-seven millions six hundred and nine thousand and nineteen, six millions five hundred and eighty-four thousand four hundred and seventy-two, eight hundred and forty-nine millions seven hundred and sixty-nine thousand four hundred and eighty, sixty thousand and nine millions eighty thousand and eleven, one thousand eight hundred and seventy-four, five thousand four hundred millions seventy thousand and ninety-eight.

VI.

(1.) A man travels 69 miles on Monday, 72 on Tuesday, 65 on Wednesday, and then returns by the same route. How many miles has he travelled altogether?

(2.) In a railway train there were 32 first-class passengers, 19 more second than first-class, 27 more third-class than first and second together. How many were in the train?

(3.) A merchant has £6540 invested in business, £1972 in the bank, £19600 worth of property, and £2842 owing to him. How much money is he worth?

(4.) Find the sum of 871296543 six times repeated.

(5.) The creation of the world took place 4004 B.C. How long was it since then till the year 1871 A.D. ?

(6.) The less of two numbers is 849 and their difference is 293. What is their sum ?

(7.) Henry VIII. ascended the throne of England in 1509 A.D., 79 years later the Spanish Armada was destroyed. 15 years later James I. ascended the throne, 39 years later the civil war commenced, 7 years later the Commonwealth began, 11 years later Charles II. was restored, and 28 years later the Revolution took place. What is the date of the last mentioned event ?

(8.) There are supposed to exist in the world, 2 thousand species of mammals, 8 thousand species of birds, 2 thousand species of reptiles, 8 thousand species of fishes, 20 thousand species of molluscs, 5 thousand species of articulated animals (not including insects), 5 thousand species of radiated animals, and 200 thousand species of insects. How many species of animals are supposed to exist in the world altogether ? Express the answer in figures only.

(9.) If 1 acre of ground cost £649, what will 7 cost ?

(10.) A gentleman put £450 into the bank, and at the end of the first year had £18 of interest added to his account, he then put in £320 and at the end of the second year had £37 of interest added, he then put in £276 more, and at the end of the third year had £42 of interest added. What was his capital at the end of the third year, and how much interest had he received in all ?

VULGAR FRACTIONS.

(Initiatory Exercises.)

Terms to be explained :—*Whole numbers, fractions, numerator, denominator.*

VII.

(1.) If an apple be divided into seven equal parts, what is each part called ? What would three such parts be called ?

(2.) How many eighth parts are there in 1 lb. of sugar ? in 1 lb. of tea ? How many eighth parts of 1 lb. in 3 lbs of sugar ? in 4 lbs. of tea ?

(3.) Express in figures:—Six-elevenths, five-ninths, eight-elevenths, twelve-thirteenths, seven-tenths, eleven-thirteenths, seven and two-thirds, nine and seven forty-third parts.

(4.) $\frac{2}{3} + \frac{1}{3}$ (*ans.* $\frac{3}{3}$), $\frac{3}{8} + \frac{4}{8}$, $\frac{5}{9} + \frac{6}{9}$, $\frac{3}{10} + \frac{4}{10}$, $\frac{6}{11} + \frac{5}{11}$.

(5.) $\frac{4}{12} + \frac{5}{12} + \frac{7}{12}$ (*ans.* $\frac{16}{12}$), $\frac{9}{11} + \frac{5}{11} + \frac{3}{11}$, $\frac{5}{13} + \frac{4}{13} + \frac{7}{13}$.

(6.) $\frac{1}{9} + \frac{4}{9} + \frac{5}{9} + \frac{13}{9}$, $\frac{3}{7} + \frac{5}{7} + \frac{29}{7} + \frac{9}{7}$.

(7.) $\frac{3}{8} + \frac{4}{8} + \frac{9}{8} + \frac{15}{8}$, $\frac{4}{11} + \frac{8}{11} + \frac{5}{11} + \frac{9}{11} + \frac{1}{11}$.

(8.) John gave $\frac{2}{9}$ of his nuts to James, $\frac{4}{9}$ of them to Andrew, and $\frac{3}{9}$ of them to Robert. How many had he left to himself?

(9.) Mary having received a cake as a present, gave $\frac{2}{7}$ of it to her sister Jane, $\frac{1}{7}$ to her brother John, and $\frac{2}{7}$ to her cousin. How much of it did she give away?

SUBTRACTION.

Sign —, MINUS. Terms to be explained :—*Subtraction, minuend, subtrahend, remainder, difference, excess, minus.*

MENTAL EXERCISES.

a. Select some number and rapidly subtract 2 or any of the other digits, thus :—100, 98, 96, &c. 100, 97, 94, 91, &c.

b. 9 from 16, 9 from 14, 9 from 19, &c. 7 from 13, 7 from 12, 7 from 18, &c.

c. What number added to 6 will make 9? What number added to 8 will make 11? &c.

d. 27 — 16, 18 —13, 36 — 18, &c.

e. 9 — 2 + 6 + 2 —3, &c., and similar exercises.

VIII.

(1.)	(2.)	(3.)	(4.)
645	976	895	614
434	343	762	302
Ans. 211			

(5.)	(6.)	(7.)	(8.)
9648	8976	6453	8976543210
635	54	3421	1234567890
			Ans. 7741975320

(9.) 8765490123
6453270013

(10.) 693
484

(11.) 745
698

(12.) 684
485

(13.) 764
676

(14.) 68432
49016

(15.) 89645
9798

(16.) 64006
46119

(17.) 896764
698916

(18.) 149684
39616

(19.) 168010
99191

(20.) 610496
391968

(21.) 47698435
19849763

(22.) 91019010
49198179

(23.) 61409835
61391469

(24.) 967458324 — 674596737.
(25.) 864314832 — 683019068.
(26.) 810963108 — 9768329.
(27.) 901010101 — 123456789.
(28.) 999888777 — 888989878.
(29.) 605403201 — 506504302.
(30.) 618390600 — 89645601. *Ans.* 528744999.
(31.) 694897 — 68549 — 9768 — 894.
(32.) 987654321 — 123456789 — 12345678 — 1234567 — 123456.
(33.) 4689 — 648 + 5698 — 5989 + 89. *Ans.* 3839.
(34.) 769 + 896 — 489 — 396 + 42 —81.
(35.) 6801 — 859 — 968 + 764 — 893.

(36.) 49 + 89 — 16 — (64 + 35). *Ans.* 23.
(37.) 8964 + 987 — (96 + 89) — (109 + 16).
(38.) (648 — 49 + 96) — (560 + 98 —67).
(39.) 13 + 79 — (64 — 35 + 49) + (69 — 54) — 29.
(40.) 1001 — 987 + (1001 — 876) + (1001 — 765) — (987 — 698).

(41.) *From* seven thousand eight hundred and ninety-seven, *subtract* four thousand six hundred and sixty-three.

(42.) *From* sixty-five thousand one hundred and forty-

seven, *subtract* forty-three thousand five hundred and twenty-three.

(43.) *From* forty-two thousand five hundred and seventy, *take* thirty-six thousand seven hundred and seventy-one.

(44.) *What is the remainder when* two thousand six hundred and forty-seven *is subtracted from* thirty-nine thousand five hundred and one?

(45.) *What is the difference between* six hundred and forty-five thousand *and* nine hundred and seventy-five?

(46.) *What is the difference between* six hundred and forty-three thousand five hundred and seventy-four *and* three hundred and seventy-nine thousand eight hundred and seventy-nine?

(47.) *What is the excess* of eight hundred and sixty-four thousand four hundred and forty *over* six hundred and eighty-nine thousand three hundred and ninety-nine?

(48.) *How much greater is* one million two hundred and sixty-nine thousand five hundred and seventy-five *than* one million one hundred and seventy-two thousand five hundred and seventy-eight?

(49.) *How much less is* five millions eight hundred thousand nine-hundred and seventy-eight *than* eight millions six hundred and nine thousand five hundred?

(50.) *Whether is* two millions five hundred and sixty thousand two hundred and twenty-one *greater or less than* two millions five hundred and six thousand nine hundred and ninety-eight? and by how much?

(51.) *What number must be subtracted from* eight millions five hundred and forty-five thousand six hundred and eighty-one *to leave* nine hundred and seventy-six thousand four hundred and nineteen?

(52.) *What number must be added to* six hundred and forty-five thousand three hundred and seventy-five *to make* one million and one?

(53.) *The greater of two numbers is* two millions five hundred and five thousand four hundred and four, *and their difference is* one million ninety thousand and eighty. Find the less.

(54.) *The sum of two numbers is* five millions, *and the less is* one million six hundred and five thousand four hundred and nine. Find the greater.

(55.) *The sum of two numbers is* four millions four thousand and four, *and the greater is* three millions forty thousand and forty. Find the less.

(56.) *How many times is* six hundred and eighty-nine thousand five hundred and forty-seven *contained in* four millions one hundred and thirty-seven thousand two hundred and eighty-two?

(57.) *What is the remainder when* eighty-four millions five hundred and sixty-nine thousand four hundred and fifty-three *is subtracted as often as possible* from three hundred and thirty-eight millions three hundred and seventy-seven thousand eight hundred and thirteen?

(58.) Subtract 4 hundred from 13 hundred.

(59.) Subtract 649 thousand from 960 thousand.

(60.) Take 999 billions from 1000 billions.

(61.) If the difference between two numbers be 13 and 500 be added to each number, what will their difference be then?

IX.

(1.) From 3 gross, 5 dozen, 2 score and nine, subtract 2 gross, 6 dozen, 3 score and 11.

(2.) How many years elapsed between the accession of George I. in 1714 and that of Queen Victoria in 1837?

(3.) Two travellers set out on a journey at the same time from the same place. The first day A travelled 106 miles by rail and walked 16; the second day he rode 29 miles and sailed 9. The first day B drove 31 miles, and the second day travelled 99 miles by rail. How many miles were they apart at the end of the second day?

(4.) Kepler was born in 1571 and Galileo was 7 years older than he. In what year was Galileo born?

(5.) A merchant commenced business with a capital of £2500. The first year his losses amounted to £695 and his gross gains to £749. The second year he gained £947 and lost £348. The third year he lost £219 and gained £875. His average expenses were £250 per annum. What was his capital at the end of the third year, and how much had he gained after deducting losses and expenses?

(6.) A carriage and two horses cost £165; each horse cost £49. What was the price of the carriage?

(7.) In one box there are 976 oranges, and in another 842. If 436 be sold out the first box and 349 out of the second, and then 98 be put out of the first into the second, and 69 out of the second into the first, how many oranges will then be in each box, and how many more in the one than in the other?

(8.) John had just as many nuts more than James as James had more than Robert. Now Robert had 2 score and 9, and James had 5 dozen and 8. How many had John?

(9.) If 5 yds. of cloth cost 85s., and 4 yds. cost 68s., what is the price of 3 yds.?

(10.) Three merchants possess among them £17648. A and B have £13896, B and C have £8974. How much has each of them?

VULGAR FRACTIONS—*continued.*

X.

(1.) $\frac{7}{11} - \frac{4}{11}$ (*ans.* $\frac{3}{11}$), $\frac{5}{13} - \frac{5}{13}$, $\frac{3}{4} - \frac{1}{4}$, $\frac{5}{7} - \frac{3}{7}$.

(2.) $\frac{9}{17} - \frac{7}{17}$, $\frac{11}{19} - \frac{8}{19}$, $\frac{22}{23} - \frac{17}{23}$, $\frac{37}{43} - \frac{19}{43}$, $\frac{119}{160} - \frac{76}{160}$.

(3.) $9\frac{5}{7} - 6\frac{3}{7}$ (*ans.* $3\frac{2}{7}$), $11\frac{4}{9} - 9\frac{3}{9}$, $16\frac{5}{11} - 13\frac{1}{11}$.

(4.) $8\frac{4}{5} - 6\frac{3}{5}$ (*ans.* $1\frac{3}{5}$), $6\frac{4}{5} - 4\frac{4}{5}$, $11\frac{2}{11} - 6\frac{4}{11}$.

(5.) $10\frac{5}{8} - 7\frac{1}{8}$, $13\frac{1}{3} - 11\frac{2}{3}$, $24\frac{3}{7} - 19\frac{6}{7}$.

(6.) $136\frac{3}{13} - 128\frac{1}{13}$, $64\frac{5}{9} - 63\frac{1}{9}$, $72\frac{1}{2} - 69\frac{5}{8}$.

(7.) $97\frac{4}{13} - 31\frac{7}{13}$, $101\frac{6}{11} - 99\frac{5}{11}$, $204\frac{7}{12} - 108\frac{1}{12}$.

(8.) $469\frac{7}{11} - 372\frac{9}{11}$, $569\frac{1}{11} - 321\frac{1}{16}$, $411\frac{17}{19} - 91\frac{8}{19}$.

(9.) $561\frac{8}{21} - 560\frac{11}{21}$, $610\frac{8}{27} - 509\frac{15}{27}$, $918\frac{13}{29} - 817\frac{19}{29}$.

(10.) $\frac{4}{7} + \frac{3}{7} + \frac{1}{7} - \frac{5}{7} - \frac{1}{7}$ (*ans.* $\frac{1}{7}$), $\frac{5}{8} - \frac{3}{8} + \frac{4}{8} - \frac{3}{8}$.

(11.) $\frac{5}{12} + \frac{6}{12} - \frac{7}{12} + \frac{11}{12} - \frac{6}{12}$, $6\frac{3}{7} + 4\frac{1}{7} - 5\frac{4}{7} + \frac{3}{7}$ (*ans.* $5\frac{3}{7}$).

(12.) $2\frac{1}{4} + 3\frac{1}{4} - 1\frac{3}{4} - 2\frac{1}{4}$, $2\frac{4}{6} + 3\frac{1}{6} - 1\frac{5}{6} - \frac{3}{6}$.

(13.) John received $\frac{4}{5}$ of a sovereign from his uncle and spent $\frac{3}{5}$ of a sovereign. He then received $\frac{3}{5}$ of a sovereign from his aunt and spent $\frac{1}{5}$ of a sovereign. What part of a sovereign has he left?

(14.) $\frac{4}{7}$ of a pole was in the sand, $\frac{1}{7}$ in the water. How much of it was above the water?

(15.) John ate $\frac{2}{5}$ of his nuts, gave away $\frac{2}{5}$ of them, and lost $\frac{2}{5}$ of them. What part of the whole number had he left?

MULTIPLICATION.

Sign ×.

Terms to be explained :—*Multiplication, multiplicand, multiplier, factors, product.*

Mental Exercises.

a 24 × 2, 36 × 2, 25 × 3, 18 × 4, &c.

b 13 × 20, 24 × 30, 19 × 40, 32 × 50, &c.

c 15 × 14, 16 × 15, 17 × 18, 13 × 19, &c.

d (6 + 3 — 8 + 4) × 6, (7 — 3 + 4 — 1) × 8, &c.

e (8 — 4) × (6 + 3), (3 + 9) × (7 — 2), 2 × 2 × 2, &c.

f To multiply any number by 25 : affix two ciphers and divide the result by 4. Multiply 19, 21, 39, &c., by 25.

g To multiply any number by 125 : affix three ciphers and divide the result by 8. Multiply 29, 37, &c., by 125.

h To multiply any number of two figures by 11 : between the figures place the sum of the figures—thus, 63 × 11 = 693, 74 × 11 = 814.

XI.

(1.) 321 × 2, 3, 4. *Ans.* 642, 963, 1284.
(2.) 465 × 5, 6, 7. *Ans.* 2325, 2790, 3255.
(3.) 789 × 7, 8, 9.
(4.) 564 × 2, 3, 4.
(5.) 978 × 5, 6, 7.
(6.) 123 × 7, 8, 9.
(7.) 645 × 7, 8, 9.
(8.) 897 × 2, 3, 4.
(9.) 231 × 5, 6, 7.
(10.) 697 × 7, 8, 9.

(11.) 6781295043 × 2, 3, 4.
(12.) 5670184932 × 5, 6, 7.
(13.) 4569093821 × 7, 8, 9.
(14.) 3458982910 × 9, 11, 12.
(15.) 8760589798 × 9, 11, 12.

(16.) 8945675 × 10, 100.
(17.) 9056786 × 100, 1000.
(18.) 3467890 × 30, 50, 70.
(19.) 8978609 × 800, 900, 7000.
(20.) 6745901 × 1100, 12000.

Terms to be explained :—*Composite numbers, prime numbers.*

MENTAL EXERCISE.—What are the factors of 14, 16, 18, 22, 24, 15, 21, 27, 33, 36, 28, 32, 44, 48, 25, 35, 45, 55, 42, 54, 66, 72, 49, 56, 63, 77, 84, 64, 88, 96, 81, 99, 108, 121, 132, 144?

XII.

(1.) 3412765 × 14, 16, 18. *Ans.* 47778710.
54604240.
61429770.

(2.) 9806574 × 15, 21, 24.
(3.) 2301654 × 22, 27, 33.
(4.) 8715463 × 28, 32, 36.
(5.) 4523876 × 25, 44, 48.
(6.) 8917685 × 35, 45, 55.
(7.) 5634987 × 42, 54, 66.
(8.) 9028796 × 49, 56, 72.
(9.) 8764329 × 96, 99, 108.
(10.) 6542107 × 121, 132, 144.
(11.) 96458307 × 630, 770, 840.
(12.) 87367218 × 6400, 8800, 96000.
(13.) 78276309 × 81000, 990, 12100.

XIII.

(1.) 647983 × 13, 19, 23.
Ans. 8423779.
12311677.
14903609.
(2.) 758094 × 29, 31, 37.
(3.) 536872 × 41, 43, 59.
(4.) 976487 × 47, 53, 61.
(5.) 865376 × 65, 71, 83.
(6.) 678987 × 67, 79, 87.
(7.) 567876 × 89, 101, 103.
(8.) 789098 × 91, 109, 113.
(9.) 432678 × 97, 107, 119.
(10.) 608934 × 127, 139, 143.

(11.) 683019 × 345, 678.
Ans. 235641555.
463086882.
(12.) 572908 × 368, 457.
(13.) 794120 × 579, 806.
(14.) 342876 × 850, 706.
(15.) 453987 × 942, 385.
(16.) 842109 × 2345, 6789.
(17.) 953210 × 3087, 8009.
(18.) 731098 × 6503, 7092.
(19.) 382907 × 6007, 1671.
(20.) 289765 × 4576, 3908.

(21.) 6740291 × 82340.
(22.) 8959183 × 62009.
(23.) 450090 × 80075.
(24.) 398097 × 67009.
(25.) 839765 × 87965.
(26.) 8170983 × 890067.
(27.) 908963 × 769005.
(28.) 6475328 × 680007.
(29.) 5364217 × 900008.
(30.) 7586439 × 456789.

XIV.

(1.) *Multiply* six hundred and forty-nine millions eight hundred and sixty-five thousand three hundred and nine, *by* ninety-six.

(2.) *Multiply* eighty thousand nine hundred and seventy millions sixty-seven thousand and eight, *by* nine thousand and seven.

(3.) *What is the product of* six thousand seven hundred and sixty-five, *multiplied by* three thousand eight hundred and seven?

(4.) *What number is equal to* seven hundred and nine *times* eighty-nine millions four hundred and seventy-four thousand?

(5.) *What number is equal to* six millions four hundred and seventy-five thousand six hundred and eighty-nine *times* eighty-nine?

(6.) *How much greater is the product of* seventy-five thousand six hundred and forty-nine *and* twenty thousand eight hundred and forty-two, *than the product of* seventy-four thousand nine hundred and eighty-nine, *and* nineteen thousand eight hundred and seventy-two?

(7.) *From the sum of* eight hundred and seventy-four, ninety-seven, six thousand five hundred, *subtract the sum of* seven hundred and sixty-nine, eighty-four, nine hundred and forty-nine, five hundred and seventy-nine, *and multiply the remainder by* six hundred and forty-five.

(8.) *Find by how many* nine hundred and seventy-eight *multiplied by* eight hundred and seventy-nine *is greater than* eight hundred and seventy-six *multiplied by* six hundred and seventy-eight.

(9.) *Multiply* nine hundred and eighty-five billions *by* seventy-four.

(10.) *Multiply* six hundred and seven millions *by* forty-nine thousand.

XV.

Terms to be explained:—*Square, or second power; cube, or third power; fourth power, &c.; indices; continued product.*

Mental Exercises.

a. What is the square of 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, &c. ?

b. What is the cube of 2, 3, 4, 5, 6, 7, 8, &c. ?

c. $2^2 - 2^2$, $3^3 - 3^3$, $4^3 - 4^3$, $5^3 - 5^2$, $2^3 + 2^2$, $3^3 + 3^2$, $2^2 \times 2^2$, $3^3 \times 3^2$, &c.

d. To find the square of any number :—Multiply the given number + the units, by the number — the units, and add the square of the units ; thus the square of 74 = 78 × 70 + 16. What is the square of 39, 84, 96, &c. ?

Find the square of—		Find the cube of—	
(1.) 19.	(6.) 897.	(11.) 17.	(16.) 863.
(2.) 21.	(7.) 698.	(12.) 23.	(17.) 789.
(3.) 43.	(8.) 709.	(13.) 41.	(18.) 607.
(4.) 69.	(9.) 807.	(14.) 79.	(19.) 811.
(5.) 74.	(10.) 6785.	(15.) 93.	(20.) 2409.

(21.) 13 × 17 × 19 × 23 (*Ans.* 96577.).
(22.) 29 × 31 × 37 × 43.
(23.) 234 × 567 × 890.
(24.) 890 × 760 × 500.
(25.) 700 × 800 × 900.
(26.) (74 + 63) × (89 + 47) (*Ans.* 18632.).
(27.) (96 — 74) × (98 —69).
(28.) (29 — 14 + 19) × (64 + 23 — 59).
(29.) (64 — 39) × (23 + 19) × (72 — 68).
(30.) $(19^2 - 17^2) \times (9^3 + 8^3) \times (125 - 5^3)$.

XVI.

SHORT METHODS.

Ex. 1. 874 × 999. 874000 = 874 × 1000.
Subtract 874.

873126 = 874 × 999.

Ex. 2. 345 × 798. 276000 = 345 × 800.
Subtract 690 = 345 × 2.

275310 = 345 × 798.

Ex. 3. 893×427.

$$\begin{array}{r} 893 \\ 427 \\ \hline 6251 \\ 37506 \\ \hline 381311 \end{array} \quad \begin{array}{l} = 893 \times 7. \\ = 6251 \times 60 = 893 \times 420. \\ \\ = 893 \times 427. \end{array}$$

Ex. 4. 674×19.

$$\begin{array}{r} 674 \\ 19 \\ \hline 12806 \end{array}$$

$19 \times 4 = 76$, $19 \times 7 + 7 = 140$, &c.

(1.) $68349 \times 99, 98, 97.$
(2.) $42967 \times 999, 998, 997.$
(3.) $63458 \times 567, 729, 486.$
(4.) $84675 \times 972, 856, 648.$
(5.) $67438 \times 13, 17, 18, 19.$
(6.) $96408 \times 1317, 15019.$

XVII.

(1.) What is the difference between 6 apples multiplied by 9, and 9 apples multiplied by 6? Would it be correct to say "9 multiplied by 6 apples"? Why?

(2.) Find the difference between 98×74, and 74×98. Explain the result.

(3.) Find the continued product of 17, 19, 23, and 29.

(4.) If 1 yd. of cloth cost 29 shillings, what is the price of 349 yds.?

(5.) There are 98 omnibuses in a city, and, *on an average*, 273 people patronise each in the course of a day. How many passengers do they carry in a year of 52 weeks, running 6 days in each week?

(6.) Multiply 96 by 42. If we were first to multiply the multiplicand by 8, how many times would the product be increased? If we were first to multiply the multiplier by 7, how many times would the product be increased? If we were first to multiply the one by 5 and the other by 4, how many times would the product be increased?

Find the answer in each of these cases from the product first found.

(7.) A person bought 35 railway shares when they were selling at £69 a share, and afterwards sold out when they were selling at £73. What did he gain by the transaction?

(8.) There are two numbers, 49 and 37. By how much does the difference of their cubes exceed the cube of their difference?

(9.) A body of soldiers was formed into a solid square, with 49 men on each side. If they were arranged in a column, 51 men deep, with 47 in front, how many would be left out?

(10.) If one man can build 3 yds. of wall in a day, how many yds. could 29 men build in 18 days?

(11.) If a cistern can be filled in 25 minutes by two pipes, one discharging 19 gallons a minute, and the other 27 gallons a minute, how many gallons does the cistern hold?

XVIII.

Terms to be explained:—*Proper fractions, improper fractions, mixed numbers.*

(1.) $\frac{3}{5} \times 5$ (*ans.* $\frac{19}{5}$), $\frac{3}{4} \times 6$, $\frac{4}{7} \times 3$, $\frac{5}{9} \times 7$, $\frac{8}{11} \times 5$, $\frac{6}{13} \times 11$.

(2.) $\frac{5}{8} \times 12$, $\frac{4}{11} \times 13$, $\frac{5}{9} \times 8$, $\frac{13}{14} \times 11$, $\frac{17}{19} \times 18$, $\frac{21}{23} \times 12$.

(3.) How many third parts of a yard are there in 16 yards? How many in $9\frac{2}{3}$ yards?

(4.) Express as improper fractions: $4\frac{3}{5}$ (*ans.* $\frac{23}{5}$), $6\frac{4}{5}$ (*ans.* $\frac{34}{5}$), $8\frac{9}{10}$, $11\frac{6}{7}$, $8\frac{9}{11}$, $9\frac{7}{9}$, $10\frac{11}{12}$, $7\frac{13}{14}$, $11\frac{11}{13}$.

(5.) $18\frac{4}{5}$, $21\frac{5}{7}$, $342\frac{8}{9}$, $897\frac{11}{13}$, $745\frac{9}{13}$, $849\frac{13}{14}$, $645\frac{17}{21}$.

(6.) Express 6 as a fraction, with denominator 9 (*ans.* $\frac{54}{9}$); 8, with den. 11; 16, with den. 11; 14, with den. 12; 29, with den. 19; 31, with den. 29.

(7.) $(\frac{4}{9} + \frac{3}{9}) \times 6$ (*ans.* $\frac{42}{9}$), $(\frac{5}{11} + \frac{3}{11}) \times 8$, $(\frac{9}{11} - \frac{4}{11}) \times 9$ (*ans.* $\frac{45}{11}$), $(\frac{8}{13} - \frac{4}{13}) \times 11$, $(\frac{9}{7} - \frac{2}{7}) \times 13$.

(8.) $(\frac{9}{7}-\frac{3}{7}+\frac{4}{7})\times 6$, $(\frac{4}{5}+\frac{3}{5}-\frac{4}{5}-\frac{1}{5})\times 4$, $(\frac{8}{11}-\frac{4}{11}+\frac{5}{11}-\frac{1}{11})\times 9$, $(\frac{3}{8}+\frac{4}{8}+\frac{1}{8}-\frac{6}{8})\times 9$.

(9.) $(\frac{4}{5}+\frac{1}{5}-\frac{3}{5})\times 6+(\frac{2}{5}-\frac{3}{5}+\frac{5}{5})\times 5$ (*ans.* $\frac{27}{5}$), $(\frac{6}{11}+\frac{4}{11})\times 5-(\frac{8}{11}-\frac{4}{11}+\frac{1}{11})\times 9$.

(10.) $(\frac{9}{7}-\frac{3}{7})\times 2+(\frac{4}{7}+\frac{3}{7})\times 3-(\frac{6}{7}-\frac{2}{7})\times 4$, $(\frac{8}{9}+\frac{3}{9})\times 3-(\frac{6}{9}-\frac{3}{9})\times 4+(\frac{7}{9}+\frac{1}{9})\times 6$.

(11.) George bought $2\frac{3}{4}$ lbs. of nuts, and he found that after giving $\frac{1}{4}$ lb. of them to each of his companions, he had just $\frac{1}{4}$ lb. left to himself. How many companions has he?

(12.) A man walks $3\frac{4}{5}$ miles to his work every day, and the same distance home again. How many fifths of a mile does he walk in a week of 6 days?

DIVISION.

Sign $\div$, as $6 \div 2$; or $\frac{6}{2} = 3$. Terms to be explained:—*Division, dividend, divisor, quotient, complete quotient, remainder.*

Mental Exercises.

a. $\frac{3}{12}$, $\frac{5}{12}$, $\frac{7}{12}$, $\frac{8}{12}$; $\frac{9}{12}$, $\frac{13}{8}$; $\frac{8}{4}$, $\frac{9}{4}$; $\frac{10}{5}$, $\frac{13}{8}$; $\frac{9}{6}$, $\frac{8}{6}$; $\frac{13}{7}$, $\frac{8}{7}$; $\frac{11}{9}$, $\frac{13}{9}$, &c.

b. $\frac{24}{2}$, $\frac{99}{3}$, $\frac{75}{4}$, $\frac{89}{9}$, &c.

c. Multiply the half of 12 by the third part of 18; the fourth part of 20 by the fifth part of 30, &c.

d. To divide any number by 25—Multiply by 4, and divide the result by 100. Divide 896 by 25.

e. To divide any number by 125—Multiply by 8, and divide the result by 1000. Divide 968 by 125.

f. What is the square root of 9, 16, 25, &c.?

g. $\sqrt{36}$, $\sqrt{49}$, $\sqrt{64}$, $\sqrt[3]{8}$, $\sqrt[5]{125}$, &c.

h. $\sqrt{\left\{\left\{\frac{\sqrt{(2^3\times 3-8)}}{3^2\times 2-4^2}\right\}^2\times 5+5\right\}}$

Note.—Sums like the above should be put down on the black board step by step, the pupils meanwhile calculating mentally.

XIX.

In the following find the complete quotient :—

(1.) 69845164 ÷ 2, 3, 4.
Answers, 34922582.
23281721⅓.
17461291.

(2.) 87638495 ÷ 2, 3, 4.

(3.) 987654321 ÷ 4, 5, 6.

(4.) 76489674 ÷ 4, 5, 6.

(5.) 123456789 ÷ 7, 8, 9.

(6.) 41019087 ÷ 7, 8, 9.

(7.) 87649839 ÷ 9, 11, 12.

(8.) 68490510 ÷ 9, 11, 12.

(9.) 81091198 ÷ 3, 5, 7.

(10.) 876459737 ÷ 2, 4, 6.

(11.) 468428646 ÷ 7, 9, 11.

(12.) 135797531 ÷ 6, 8, 12.

In the following find the quotient and remainder :—

(13.) 419019087 ÷ 6, 7, 8.

(14.) 305070901 ÷ 9, 11, 12.

(15.) 416283658 ÷ 5, 7, 9.

In the following find the complete quotient :—

(16.) 845832146 ÷ 10, 100, 1000.

(17.) 643214630 ÷ 100, 1000, 10000.

(18.) 834106980 ÷ 40, 50, 70.

(19.) 149683219 ÷ 800, 600, 900.

(20.) 764389763 ÷ 11000, 60000, 1200.

VULGAR FRACTIONS—*continued.*

XX.

Reduce to whole or mixed numbers :—

(1.) $\frac{69}{7}$, $\frac{111}{8}$, $\frac{119}{11}$, $\frac{421}{5}$ (*answers*, $12\frac{5}{7}$, $13\frac{7}{8}$, $10\frac{9}{11}$, $84\frac{1}{5}$).

(2.) $\frac{908}{6}$, $\frac{742}{7}$, $\frac{876}{9}$, $\frac{981}{12}$.

(3.) $\frac{1142}{9}$, $\frac{1372}{10}$, $\frac{1680}{11}$, $\frac{1971}{12}$.

(4.) $\frac{4}{5}\times 5$ (*ans.* $2\frac{1}{2}$), $\frac{6}{7}\times 8$ (*ans.* $6\frac{6}{7}$), $\frac{5}{6}\times 4$, $\frac{3}{8}\times 6$.

(5.) $\frac{5}{7}\times 7$, $\frac{6}{7}\times 4$, $\frac{4}{5}\times 8$, $\frac{7}{8}\times 9$.

(6.) $6\frac{3}{4}\times 9$ (*ans.* 60), $7\frac{4}{5}\times 5$ (*ans.* 39), $6\frac{3}{7}\times 8$, $9\frac{10}{11}\times 11$.

(7.) $\frac{4}{5}\div 5$ (*ans.* $\frac{4}{25}$), $\frac{6}{7}\div 8$ (*ans.* $\frac{6}{56}$), $\frac{5}{6}\div 4$, $\frac{3}{7}\div 6$.

(8.) $\frac{5}{6}\div 7$, $\frac{6}{7}\div 4$, $\frac{4}{5}\div 8$, $\frac{7}{8}\div 9$.

(9.) $6\frac{3}{4}\div 9$ (*ans.* $\frac{19}{27}$), $7\frac{4}{5}\div 5$ (*ans.* $1\frac{14}{25}$), $6\frac{6}{7}\div 8$, $9\frac{10}{11}\div 11$.

(10.) $8\frac{4}{5}\div 5$, $6\frac{3}{4}\div 7$, $9\frac{1}{3}\div 5$, $8\frac{3}{5}\div 7$.

(11.) $10\frac{1}{4}\div 3$, $11\frac{3}{5}\div 6$, $9\frac{4}{5}\div 11$, $11\frac{3}{8}\div 12$.

(12.) $4\frac{3}{7}\div 5$, $9\frac{1}{8}\div 10$, $6\frac{3}{5}\div 7$, $8\frac{3}{4}\div 9$.

XXI.

In the following find the complete quotient:—

(1.) 976458964 ÷ 14, 15, 16.
Answers. $69747068\frac{12}{14}$.
$65097264\frac{4}{15}$.
$61028685\frac{4}{16}$.

(2.) 865347853 ÷ 18, 21, 22.
(3.) 754236742 ÷ 24, 27, 28.
(4.) 698497850 ÷ 32, 44, 48.
(5.) 706009608 ÷ 25, 33, 45.
(6.) 695986908 ÷ 35, 36, 42.
(7.) 109865832 ÷ 54, 66, 72.
(8.) 761498306 ÷ 49, 64, 88.
(9.) 601900690 ÷ 55, 63, 56.

In the following find the quotient and remainder:—

(10.) 769810900 ÷ 77, 84, 96.
(11.) 345678912 ÷ 81, 99, 108.
(12.) 219876543 ÷ 121, 132, 144.

In the following find the complete quotient:—

(13.) 864596006 ÷ 490, 560, 9600.
(14.) 678009608 ÷ 81000,990000, 1080000.
(15.) 430201967 ÷ 121000, 1320000, 1440000.

XXII.

In the following find the complete quotient:—

(1.) 896752105 ÷ 13, 17, 19, 23.
Answers. $68980931\frac{2}{13}$
$52750123\frac{14}{17}$
$47197479\frac{4}{19}$
$38989221\frac{12}{23}$

(2.) 325874601 ÷ 29, 31, 37, 41.
(3.) 123456789 ÷ 43, 47, 59, 61.
(4.) 987654321 ÷ 67, 71, 73, 79.
(5.) 111111111 ÷ 83, 89, 97, 101.
(6.) 436019087 ÷ 103, 107, 109, 113.
(7.) 645908196 ÷ 127, 131, 137, 139.
(8.) 8764312897 ÷ 149, 197, 257.
(9.) 1000000000 ÷ 151, 199, 263.

(10.) 9871236540 ÷ 157, 211, 269.
(11.) 8764981070 ÷ 163, 223, 271.
(12.) 9876498379 ÷ 269, 331, 389.
(13.) 6418321096 ÷ 379, 349, 409.
(14.) 7689639619 ÷ 798, 987, 789.
(15.) 1010101010 ÷ 6742, 8913, 7608.
(16.) 1919191919 ÷ 4567, 8907, 6428.
(17.) 9181716151 ÷ 6419, 8764, 9839.
(18.) 16438009610 ÷ 34567, 89642.
(19.) 67891456837 ÷ 67809, 45683.
(20.) 14832146964 ÷ 830061, 456789.
(21.) 96431480068 ÷ 679841, 196843.

In the following find the quotient and remainder :—

(22.) 46983214698 ÷ 4896143, 8900698.
(23.) 710980109686 ÷ 89600, 987600.
(24.) 671489631489 ÷ 647000, 67190000.
(25.) 896419631483 ÷ 19840000, 71960000.

XXIII.

(1.) *Divide* eight thousand nine hundred and sixty-five *by* 11. If we were first to multiply the dividend by 5, would the quotient be increased or diminished?—and how many times?

(2.) *Divide* eighty-six thousand four hundred and fifty-six *by* 12. If we were first to multiply the divisor by 6, would the quotient be increased or diminished?—and how many times? If we were first to multiply both the dividend and divisor by 6, would the quotient be increased or diminished? What effect would it have on the remainder?

(3.) *Divide* two hundred and seventy-two thousand eight hundred and sixty-six millions ten thousand and eighty-eight *by* forty-two.

(4.) *Divide* six thousand three hundred and twenty-two millions nine hundred and eighty-eight thousand six hundred and seventy two *by* ninety thousand six hundred and eight.

(5.) *Divide* four hundred and fifty-nine millions six hundred and fifty-four thousand eight hundred and nineteen *by* two thousand eight hundred.

(6.) *If* twenty-four millions seven hundred and forty thousand four hundred and nine *be the quotient*, thirty-two *the remainder*, and thirty-nine *the divisor*, what is the dividend?

(7.) *If* six billions four hundred and sixty-nine thousand eight hundred and nine millions five hundred and forty-two thousand six hundred and nineteen *be the dividend, and* ninety-nine *the divisor*, what is the remainder?

(8.) *If* fourteen millions fifty-five thousand and seventy *be the product, and* two thousand three hundred and six *the multiplier*, what is the multiplicand?

(9.) *If* six billions nine hundred and eight thousand and seventeen millions nine thousand six hundred and one *be the dividend*, thirty-two *the remainder*, and one hundred and seventy-seven thousand one hundred and twenty-eight millions six hundred and forty-one thousand two hundred and seventy-one *the quotient*, what is the divisor?

(10.) *Divide* 16 *by* 4; sixteen thousand *by* four thousand; sixteen billions *by* four billions.

XXIV.

(1.) If £9648 were divided equally among 36 persons, how much would each receive?

(2.) What is the twenty-seventh part of £11853?

(3.) How often will a wheel which measures 16 feet in circumference turn in 6 miles, each mile containing 5280 feet?

(4.) How long will it take a person to read a work of 9 volumes, each containing 464 pages, if he read 116 pages daily?

(5.) If a cistern can be filled in 39 minutes by a pipe discharging 42 gallons a minute, in how many minutes may it be emptied by one discharging 18 gallons a minute? If both were opened when the cistern contained 1182 gallons, in what time would it be filled?

(6.) If 16 yards cost 48 shillings, what is the price of 19 yards?

(7.) If 27 horses cost £1134, and one horse be worth 21 sheep, what is the price of a sheep?

(8.) A railway is 568 miles in length, and cost $4\frac{1}{2}$ millions of money in making, all but £7688. How much did it cost per mile?

(9.) The eighth part of an ounce of spider's silk is in length equal to 400 miles. How many ounces of it would reach from the earth to the sun, a distance of 93 millions of miles?

(10.) In a besieged city there were 29,952 cwts. of flour, 237,888 loaves, and 392 barrels of salted meat. It was calculated that 312 cwt. of flour would be consumed daily, and that 28 loaves or $\frac{1}{8}$ of a barrel of meat was equivalent to 1 cwt. of flour. For how many days would the garrison be able to hold out? How long, if they were put on half rations?

VULGAR FRACTIONS—*continued.*

Terms to be explained:—*Lowest terms, common denominator, complex fractions, compound fractions.*

Tests of divisibility:—

Any number is divisible by

2, if its unit's figure be even;
3, if the sum of its figures be divisible by 3;
4, if the number formed by the two figures on the right be divisible by 4;
5, if its unit's figure be 0 or 5;
6, if it be divisible by 2 and by 3;
7, by trial;
8, if the number formed by the three figures on the right be divisible by 8;
9, if the sum of its figures be divisible by 9
10, if its unit's figure be 0;
11, if the difference between the sum of the figures in the even places and the sum of those in the odd places be either 0 or a number divisible by 11;
7, 11, or 13, when the number consists of three figures repeated;
73 and 137, when the number consists of four figures repeated —thus 42394239 and 970097 (*i.e.*, 00970097), are so divisible.

XXV.

Reduce to their lowest terms :—

(1.) $\frac{105}{120}$ (*ans.* $\frac{7}{8}$), $\frac{84}{105}$ (*ans.* $\frac{4}{5}$), $\frac{198}{216}$, $\frac{72}{108}$.

(2.) $\frac{288}{768}$, $\frac{140}{245}$, $\frac{180}{216}$, $\frac{288}{648}$.

(3.) $\frac{528}{576}$, $\frac{400}{416}$, $\frac{216}{234}$, $\frac{1305}{1350}$.

(4.) $\frac{7\times4\times9\times6}{8\times21\times3\times9}$ (*ans.* $\frac{1}{3}$), $\frac{14\times7\times6\times9}{21\times18\times2\times3}$, $\frac{6\times4\times18\times21}{14\times8\times24\times12}$.

(5.) $\frac{4\times9\times6\times3}{6\times3\times18\times5}$, $\frac{6\times3\times5\times7}{9\times9\times15\times7}$, $\frac{6\times9\times15\times21}{28\times20\times12\times18}$.

(6.) $\frac{4\times6\times18\times9}{12\times8\times9\times6}$, $\frac{4\times18\times6\times7\times11}{22\times9\times21\times9\times6}$, $\frac{21\times4\times54\times8}{8\times27\times14\times12}$.

Simplify and reduce to their lowest terms :—

(7.) $\frac{4-6+5}{8+2-6}$ (*ans.* $\frac{3}{4}$), $\frac{8+1-4}{6-5+3}$, $\frac{11+12-4-8}{6-3+10}$.

(8.) $\frac{11+12-6+4}{6-9+18-1}$, $\frac{11+12-13}{4+9+8-6}$, $\frac{(8-6+4)\times3}{(7+4-8)\times2}$.

(9.) $\frac{(6-4+3)\times8}{(7+10-2)\times9}$, $\frac{(6-4)\times(8+2)}{(7+3)\times(6+3)}$, $\frac{(6-1+2)\times(8+3-2)}{(7+3)\times(12+4)}$.

What is the difference between—

(10.) $\frac{18}{24}$ and $\frac{18\times6}{24\times6}$? and between $\frac{18}{24}$ and $\frac{18\div6}{24\div6}$?

Simplify and reduce to their lowest terms :—

(11.) $\frac{16\div4}{25\div5}$, $\frac{21\div3}{28\div2}$, $\frac{36\div3}{48\div4}$.

(12.) $\frac{76\div2}{81\div9}$, $\frac{96\div6}{108\div9}$, $\frac{84\div2}{121\div11}$.

XXVI.

(1.) Express $\frac{3}{4}$ as a fraction having 8 as its denominator (*ans.* $\frac{6}{8}$) ; $\frac{2}{5}$, with 10 as denominator ; $\frac{2}{3}$, with 9 as denominator ; $\frac{5}{9}$, with 27 as denominator.

(2.) Express $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{4}$, as a set of fractions having the common denominator 4 (*ans.* $\frac{2}{4}$, $\frac{3}{4}$, $\frac{1}{4}$) ; $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, with c. d. 6 ; $\frac{2}{3}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{5}{6}$, with c. d. 12 ; $\frac{1}{2}$, $\frac{2}{5}$, $\frac{9}{10}$, $\frac{1}{5}$, with c. d. 10.

Reduce to fractions having a common denominator :—

(3.) $\frac{2}{3}$, $\frac{5}{6}$, $\frac{7}{9}$, $\frac{1}{2}$; $\frac{4}{5}$, $\frac{9}{10}$, $\frac{3}{5}$, $\frac{1}{2}$; $\frac{5}{6}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{3}{8}$, $\frac{1}{6}$; $\frac{5}{7}$, $\frac{11}{14}$, $\frac{3}{7}$, $\frac{1}{7}$, $\frac{9}{14}$.

(4.) $\frac{1}{2}+\frac{3}{4}$ (*ans.* $1\frac{1}{4}$), $\frac{1}{2}+\frac{1}{4}$ (*ans.* $\frac{3}{4}$), $\frac{1}{2}+\frac{1}{3}$, $\frac{1}{3}+\frac{1}{4}$.
(5.) $\frac{2}{3}+\frac{3}{4}+\frac{5}{6}$, $\frac{3}{5}+\frac{3}{4}+\frac{1}{6}+\frac{1}{2}$, $\frac{2}{3}+\frac{7}{9}+\frac{5}{6}$.
(6.) $3\frac{1}{2}+2\frac{1}{4}$ (*ans.* $5\frac{3}{4}$), $5\frac{3}{4}+4\frac{1}{2}$, $6\frac{2}{3}+\frac{1}{6}$, $4\frac{1}{3}+1\frac{7}{9}$.
(7.) $2\frac{1}{3}+\frac{3}{4}+5\frac{1}{2}$, $6\frac{4}{5}+5\frac{3}{10}+7\frac{5}{6}$, $8\frac{5}{7}+9\frac{9}{14}$.
(8.) $\frac{1}{2}-\frac{1}{3}$ (*ans.* $\frac{1}{6}$), $\frac{3}{5}-\frac{1}{4}$, $\frac{1}{4}-\frac{1}{5}$, $\frac{2}{5}-\frac{3}{10}$.
(9.) $4\frac{1}{2}-2\frac{3}{4}$ (*ans.* $1\frac{3}{4}$), $5\frac{1}{6}-4\frac{3}{5}$, $4\frac{3}{5}-1\frac{9}{10}$, $6\frac{4}{7}-1\frac{9}{14}$.
(10.) $8\frac{3}{5}-7\frac{3}{16}$, $9\frac{1}{7}-6\frac{3}{14}$, $11\frac{1}{6}-8\frac{4}{12}$, $13\frac{1}{3}-5\frac{7}{9}$.

XXVII.

(1.) $\frac{11}{12}\times 10$, $\frac{5}{11}\times 12$, $\frac{6}{13}$ of 11, $\frac{11}{12}$ of 9.
(2.) $6\frac{3}{8}\times 5$, $4\frac{2}{5}\times 7$, $8\frac{4}{7}\times 6$, $5\frac{4}{8}\times 3$.
(3.) $17\frac{5}{6}$ of 9, $6\frac{3}{4}$ of 4, $16\frac{4}{6}$ of 9, $26\frac{2}{7}$ of 8.
(4.) $\frac{9}{7}\div 5$, $\frac{4}{5}\div 8$, $\frac{8}{5}\div 4$, $\frac{3}{8}\div 4$.
(5.) $\frac{11}{12}\div 9$, $\frac{6}{11}\div 9$, $5\frac{3}{4}\div 2$, $16\frac{2}{3}\div 9$.
(6.) $8\frac{4}{5}\div 10$, $8\frac{1}{4}\div 11$, $6\frac{6}{11}\div 12$, $7\frac{1}{3}\div 12$.

(7.) $\frac{4}{5}\times\frac{10}{15}$ (*ans.* $\frac{8}{15}$), $\frac{9}{7}\times\frac{21}{24}$ (*ans.* $\frac{3}{4}$), $\frac{4}{5}\times\frac{9}{7}\times\frac{5}{9}$.
(8.) $\frac{3}{8}\times\frac{6}{9}\times\frac{3}{5}$, $\frac{4}{5}$ of $\frac{7}{8}$, $\frac{6}{7}$ of $\frac{2}{3}$.
(9.) $\frac{9}{7}$ of $\frac{4}{5}$, $\frac{9}{5}$ of $\frac{4}{7}$ of $\frac{3}{8}\times\frac{3}{9}$, $\frac{9}{7}$ of $1\times\frac{1}{6}$ of 7.
(10.) $2\frac{3}{4}\times 3\frac{3}{5}$ (*ans.* $10\frac{1}{12}$), $4\frac{3}{5}\times 6\frac{2}{5}$ (*ans.* $30\frac{4}{5}$), $7\frac{1}{3}\times 4\frac{3}{5}$.
(11.) $8\frac{1}{4}\times 7\frac{1}{3}$, $9\frac{4}{7}$ of $6\frac{2}{5}$, $8\frac{7}{8}$ of $7\frac{2}{9}$.
(12.) $\frac{4}{6}$ of $\frac{3}{8}$ of $\frac{5}{18}$ of $\frac{9}{10}$ of $1\frac{7}{5}$, $\frac{5}{6}$ of $9\times 3\frac{2}{3}\times\frac{1}{36}$ of 15.
(13.) $\frac{5}{14}\times\frac{4}{5}\times 1\frac{1}{3}\times 1\frac{3}{15}\times\frac{3}{8}$, $2\frac{1}{6}$ of $\frac{9}{10}\times 5$.
(14.) $(6\frac{7}{9}+4\frac{1}{3}-5\frac{2}{9})\times 6$, $(5\frac{6}{7}-4\frac{5}{7}-\frac{6}{14})\times 8$.
(15.) $(6\frac{1}{9}-4\frac{1}{3}+5\frac{1}{3}-2\frac{1}{3})\times 6$, $(7\frac{2}{11}+8\frac{2}{22}-6\frac{3}{11}-4\frac{10}{22})\times 9$.

(16.) $\frac{9}{11}\div\frac{4}{7}$ (*ans.* $1\frac{23}{44}$), $\frac{3}{4}\div\frac{5}{6}$ (*ans.* $1\frac{11}{10}$), $\frac{2}{5}\div\frac{4}{7}$, $\frac{3}{5}\div\frac{4}{5}$.
(17.) $\frac{8}{9}\div\frac{5}{6}$, $\frac{4}{9}\div\frac{5}{6}$, $\frac{9}{7}\div\frac{4}{5}$, $\frac{4}{5}\div\frac{7}{8}$.
(18.) $6\frac{1}{2}\div 7\frac{1}{4}$ (*ans.* $\frac{24}{29}$), $8\frac{3}{5}\div 4\frac{7}{8}$ (*ans.* $1\frac{7}{5}$), $9\frac{4}{5}\div 7\frac{1}{2}$.
(19.) $2\frac{5}{8}\div 1\frac{5}{63}$, $9\frac{9}{7}\div 4\frac{8}{21}$, $\frac{10}{11}\div 2\frac{1}{33}$.
(20.) $(3\frac{3}{4}\times 4\frac{1}{5})\div(8\frac{2}{5}\times 4\frac{2}{7})$ (*ans.* $\frac{7}{16}$). $(2\frac{4}{5}\times 6\frac{2}{4})\div(7\frac{1}{2}$ of $4\frac{2}{3})$.
(21.) $\dfrac{4\frac{1}{2}\times 9\frac{3}{5}}{4\frac{2}{15}\text{ of }14\frac{2}{5}}$, $\dfrac{6\frac{3}{5}\times 5\frac{3}{7}}{4\frac{1}{4}\times 5\frac{3}{7}}$.

(22.) $\frac{\frac{3}{4}-\frac{1}{2}+\frac{5}{6}}{1+\frac{3}{7}-\frac{5}{14}}$ (*ans.* $1\frac{1}{10}$), $\frac{2\frac{1}{2}+3\frac{3}{5}-1\frac{1}{15}}{1\frac{1}{3}-5\frac{1}{2}+4\frac{1}{3}}$.

(23.) $\frac{1\frac{1}{3}\times 1\frac{1}{5}}{\frac{5}{14}}$ (*ans.* $4\frac{4}{5}$), $\frac{1\frac{1}{2}\div\frac{3}{5}}{1\frac{5}{6}}$.

(24.) $\frac{\frac{3}{5}+\frac{1}{4}}{\frac{3}{5}-\frac{1}{4}}$, $\frac{\frac{3}{5}\times\frac{1}{4}}{\frac{3}{5}\div\frac{1}{4}}$.

(25.) $\frac{2\frac{1}{2}+3\frac{3}{4}}{3\frac{3}{4}-2\frac{1}{2}}$, $\frac{2\frac{1}{2}\times 3\frac{3}{4}}{3\frac{3}{4}\div 2\frac{1}{2}}$.

(26.) $4\frac{5}{6}-1\frac{5}{12}+3\frac{3}{8}$, $(4\frac{5}{6}\div 1\frac{5}{12})\times 3\frac{3}{8}$.

(27.) $\frac{1+\frac{1}{2}}{1-\frac{1}{4}}\div\frac{1+\frac{1}{3}}{1-\frac{1}{3}}$ (*ans.* $\frac{4}{5}$), $\frac{\frac{1}{4}+1}{1\div\frac{1}{4}}\times\frac{1+\frac{1}{3}}{1\div\frac{1}{3}}$.

(28.) $\frac{2^2+3^2-1^4}{1^3\times 3^2-2^3}$, $2^2\times\frac{3^2-2^3+1^3}{3^3\times 1^3\div 3}$.

XXVIII.

(1.) What fraction is 5 of 10 (*ans.* $\frac{1}{2}$)? 3 of 9 (*ans.* $\frac{1}{3}$)? 7 of 28? 18 of 16?

(2.) Reduce 72 to the fraction of 84, 96 to the fraction of 176, 189 to the fraction of 210, 297 to the fraction of 324.

(3.) What fraction of 112 is 252? what fraction of 432 is 576?

(4.) Reduce $\frac{3}{8}$ to the fraction of $\frac{5}{6}$ (*ans.* $\frac{4}{5}$), $\frac{1}{2}$ to the fraction of $\frac{3}{4}$ (*ans.* $\frac{2}{3}$), $5\frac{1}{2}$ to the fraction of $4\frac{1}{3}$.

(5.) Reduce $\frac{2}{5}$ to the fraction of $1\frac{1}{2}$, $4\frac{2}{3}$ to the fraction of $\frac{5}{7}$, $\frac{3}{5}$ of $\frac{1}{4}$ to the fraction of $\frac{3}{4}$ of $\frac{5}{7}$.

(6.) If $9\frac{1}{2}$ be $\frac{5}{7}$ of a certain number, what is the whole number? *Ans.* $11\frac{7}{9}$.

$9\frac{1}{2}=\frac{5}{7}$ of No. $\therefore$ The number required $=\frac{7}{5}$ of $9\frac{1}{2}=\frac{7}{5}$ of $\frac{19}{2}=\frac{133}{10}=11\frac{7}{9}$.

(7.) If $11\frac{3}{4}$ be $\frac{5}{7}$ of a number, what is the whole number?

(8.) If $5\frac{3}{5}$ be $\frac{4}{7}$ of a number, what is $\frac{3}{5}$ of the whole number?

(9.) A workman during a three month's engagement saved, the first month £$2\frac{3}{5}$, the second £$3\frac{1}{5}$, the third £$2\frac{4}{5}$. For how many weeks during the winter will this money keep him at the rate of £$\frac{3}{5}$ per week?

(10.) A said that he would give $\frac{4}{5}$ of whatever sum B gave towards a certain charity. B gave $\frac{5}{12}$ of £50. How much would A require to give?

(11.) What is the half of one-fourteenth? the sixth of one-third? the twelfth of one-half?

XXIX.

Multiplication when the Multiplier contains a Fraction.

(1.) Find the half of 6984, 9833 *Answers*, 3492, $4916\frac{1}{2}$.

(2.) Find the third of 6743, 9648.

(3.) Find the seventh of 87641, 11409.

(4.) $\frac{6}{7}$ of 45968, $\frac{5}{7}$ of 96483. *Answers*, $39401\frac{1}{7}$, $82699\frac{5}{7}$.

(5.) $\frac{4}{11}$ of 839645, $\frac{4}{11}$ of 897681.

(6.) $\frac{11}{12}$ of 1149683, $\frac{11}{12}$ of 1468971.

(7.) $678954 \times 3\frac{1}{2}$, $851911 \times 4\frac{1}{3}$. *Answers*, 2376339, $3691614\frac{1}{3}$.

(8.) $975003 \times 6\frac{1}{4}$, $857643 \times 5\frac{1}{3}$.

(9.) $761142 \times 7\frac{1}{7}$, $610109 \times 8\frac{1}{7}$.

(10.) $839764 \times 8\frac{6}{7}$, $1149683 \times 11\frac{4}{5}$. *Answers*, $7437909\frac{5}{7}$, $13157483\frac{2}{5}$.

(11.) $4896456 \times 9\frac{6}{11}$, $7412968 \times 24\frac{4}{5}$.

(12.) $8967432 \times 29\frac{4}{7}$, $7643281 \times 742\frac{1}{13}$.

(13.) $9784564 \times 900\frac{1}{17}$, $7645983 \times 7600\frac{11}{13}$.

Division when the Divisor contains a Fraction.

In the following sums find the quotient and remainder:—

(14.) $541321 \div 3\frac{1}{2}$, $694130 \div 5\frac{1}{4}$. *Answers*, $154663 +$ r. $\frac{1}{2}$, $132215 +$ r. $1\frac{1}{4}$.

(15.) $897601 \div 6\frac{1}{5}$, $674289 \div 7\frac{1}{8}$.

(16.) $87643 \div 8\frac{2}{3}$, $96459 \div 7\frac{2}{7}$.

In the following sums find the complete quotient:—

(17.) $649831 \div 11\frac{1}{3}$, $846134 \div 21\frac{2}{3}$. *Answers*, $55070\frac{8}{33}$, $39870\frac{36}{191}$.

(18.) $6897658 \div 23\frac{6}{11}$, $4964581 \div 417\frac{14}{17}$.

(19.) $6814870 \div 90\frac{9}{16}$, $8764589 \div 1000\frac{19}{21}$.

Multiplication when the Multiplicand contains a Fraction.

(20.) $648976\frac{4}{5} \times 6$, $729894\frac{5}{7} \times 8$. *Answers*, $3893860\frac{4}{5}$, $5839157\frac{5}{7}$.

(21.) $874096\frac{7}{9} \times 9$, $605908\frac{11}{13} \times 11$.

(22.) $6709845\frac{7}{8} \times 24$, $9068076\frac{11}{12} \times 27$.

(23.) $4974651\frac{1}{14} \times 32$, $7610919\frac{5}{17} \times 64$.

(24.) $4729643\frac{9}{10} \times 23$, $7642050\frac{8}{11} \times 37$.

(25.) $8745961\frac{5}{7} \times 43$, $9653875\frac{11}{12} \times 51$.

Division when the Dividend contains a Fraction.

In the following sums find the quotient and remainder :—

(26.) $642849\frac{7}{8} \div 7$, $961072\frac{5}{12} \div 9$. *Answers*, $91835 +$ r. $4\frac{7}{8}$, $106785 +$ r. $7\frac{5}{12}$.

(27.) $774961\frac{9}{11} \div 11$, $874072\frac{7}{16} \div 12$.

(28.) $6542918\frac{4}{5} \div 25$, $9754827\frac{5}{8} \div 32$.

In the following sums find the complete quotient :—

(29.) $6497832\frac{5}{14} \div 56$, $7641891\frac{9}{11} \div 84$. *Answers*, $116032\frac{45}{672}$, $90974\frac{39}{154}$.

(30.) $9621843\frac{6}{7} \div 23$, $7961776\frac{4}{11} \div 31$.

(31.) $9870019\frac{13}{17} \div 69$, $6891742\frac{11}{13} \div 73$.

Miscellaneous Exercises.

XXX.

(1.) Find the sum of 968, 47, 8745, 19, 2847, 6894, 5897, 765, 849, and 74.

(2.) *Add together* four billions six hundred and ninety-two thousand eight hundred and nine millions five hundred and forty-one thousand six hundred and seven, six hundred and eighty-four thousand seven hundred and ninety-two millions eight hundred and ninety-six thousand five hundred and eleven, ninety-six thousand eight hundred and forty-nine millions nine thousand and thirteen, eighty-seven thousand six hundred and eight millions nine hundred and ten thousand seven hundred and nine,

eight hundred and ninety-seven millions six hundred and forty-three thousand nine hundred and forty-two, *and* seven hundred and sixty-five millions eight hundred and ninty-six thousand seven hundred and sixty-five.

(3.) Express 1596 in Roman numerals.

(4.) Find the square of 249.

(5.) Five boys set out to gather nuts. Andrew gathered nine hundred and eight; Robert, seven hundred and eleven; David, one thousand and nineteen; Charles, ninety-seven; and Frank, seven hundred and forty-nine. How many did they gather among them?

(6.) From 6549862709804 take 2958974811915.

(7.) *From* nine billions six hundred and four thousand and ninety millions six hundred and eighty-two thousand five hundred and forty-nine *subtract* nine hundred and sixty-five thousand eight hundred and ninety-two millions seven hundred and ninety-three thousand six hundred and fifty-nine.

(8.) What is the difference in population between two towns, the one having eighteen thousand four hundred and fifty-three inhabitants, and the other fifteen thousand eight hundred and ninety-six?

(9.) Express the following number in words:— 897068643009.

(10.) How many years elapsed between the year MDCCLXIX and the year MDCCCLXX?

(11.) From six apple-trees there were gathered respectively three hundred and sixty-five, nine hundred and seventy-nine, four hundred and one, eight hundred and eleven, seven hundred and three, and four hundred and nineteen apples. Of these one thousand nine hundred were sold to one customer, and five hundred and nine to another. How many were left unsold.

(12.) Express the following number in words:— 8976001901893.

(13.) John got six times as many apples for his money as the number of pence which he spent on them. He spent fivepence. How many apples did he receive?

(14.) The American War of Independence commenced in the year MDCCLXXIV. How many years elapsed between that date and the end of the rebellion of the Southern States in MDCCCLXV?

(15.) On Monday Jane was dux in her class; on Tuesday, 2d; on Wednesday, 7th; on Thursday, 6th; and on Friday, 14th. What was her average place for the week?

(16.) 643549809008 × 27.

(17.) What is the product of six hundred and forty-two millions eight hundred and ninety-seven thousand five hundred and nineteen *multiplied by* six hundred and seventy-five thousand and nine?

(18.) *By how much does* twenty-nine millions eight hundred and five thousand six hundred and eleven *multiplied by* nine exceed nineteen millions seventy-eight thousand four hundred and fourteen *multiplied by* eight?

(19.) Shakespeare was born in the year MDLXIV. How old was he at the time of his death in MDCXVI?

(20.) A man bought a horse and cart for £27. The cart cost £11 less than the horse. Find the price of each.

(21.) What number must be added to 396 + 18 + 29 + 842 to make the sum equal 497 + 16 + 35 + 1197?

(22.) 896456 × 89007.

(23.) What is the difference between the cube of 99 and the square of 888?

(24.) Multiply the excess of 897654831 over 768497658 by 87.

(25.) Find the value of 8964 + 794 + 19 — 8439 + 7689 — 894.

(26.) America was discovered in MCDXCII, Canada in MCDXCIX, Japan in MDXLII, Van Dieman's Land in MDCXLII, and Behring's Strait in MDCCXXVIII. How many years elapsed between each of these discoveries?

(27.) The first Crusade commenced in 1096, and the last ended in 1291. Express these dates in Roman numerals.

(28.) 67458397 ÷ 108.

(29.) On three apple-trees there were 973 apples. On the first and second together there were 569, and on the first and third together there were 672. How many were there on each?

(30.) 9648972893704 ÷ 480000.

(31.) A stream supplies a reservoir with water at the rate of 4968 gallons per minute, and the water is discharged from it at the rate of 5856 gallons per minute. At a certain time when the sluice was opened there were 69854 gallons in the reservoir. How many gallons were there in it after 23 minutes had elapsed?

(32.) If Jane work on an average 6 sums correctly each day she is at school, how many will she work correctly in a session of 10 months, each month consisting of 4 weeks, and each week of 5 days, taking into account 11 days on which she was absent?

(33.) 17649872496 × 81.

(34.) 76089641045 × 9000.

(35.) Find the square of 49 and the cube of 37.

(36.) A person was born in 1819 and died in 1863. How old was he when he died?

(37.) If 9643 be the remainder and 11472 be the subtrahend, what is the minuend?

(38.) The wheel of a hand-barrow is 4 feet in circumference. One day it was taken a distance of 12½ miles and back again. How often did the wheel turn, there being 5280 feet in a mile?

(39.) 694872643 ÷ 8970.

(40.) A cistern can be filled in 17½ minutes by a pipe discharging 48 gallons a minute. If it can be emptied by another pipe in 21 minutes, how many gallons must be discharged by the latter per minute?

(41.) If one mile of railway requires 114 tons of iron at £13 a ton, what will be the cost of the iron required to construct a railway 47 miles in length?

(42.) If a horse trot 25 miles a-day during 6 days of the week, how many miles will it have trotted in 3 weeks?

(43.) A train, travelling at the rate of 29 miles an hour,

starts at 6 o'clock in the morning, how far will it have travelled by 11 A.M. of the same day?

(44.) How much greater is the product of 97 and 79 than the product of their sum and difference?

(45.) A farmer sold 6 horses valued at £50 each, for which he received 19 cows valued at £11 each, 5 calves at £4 each, and a score of sheep at £2 each. The rest he got in money. How much money did he receive?

(46.) The sum of two numbers is 8964, and one of them is 879. Find their product.

(47.) Find the continued product of $6+3$, $6-3$, $9-5$, $9+5$, $8-2$, $2+8$, $7-3$, and $7+3$.

(48.) If 4 men can build a wall in 16 days, in what time could 8 men build it?

(49.) In a regiment of 600 men and 59 officers, each officer received £30 of prize-money, and each man $\frac{1}{5}$ of that sum. How much prize-money was there?

(50.) If a train start at 9 A.M., and has travelled 396 miles by 8 P.M. of the same day, what was its rate per hour?

(51.) What number is that which, being divided by 6, the quotient multiplied by 5, the product divided by 10, and the quotient increased by 4, will be equal to 7?

(52.) John's grandfather is 79 years old. John's father is 42 years younger, and 23 years older than John. How old was John's grandfather when John was born?

(53.) What number must be multiplied by 55 to produce 796458960?

(54.) What number must be added to the square of 93 that it may be exactly divisible by the square of 39?

(55.) A merchant began business 21 years ago with a capital of £560. The value of his stock is now £3240. He has debts due to him to the amount of £1769, of which £345 are bad debts. He himself owes £212. How much money has he gained each year on an average?

(56.) There are two numbers, 21 and 31. By how much does the difference of their cubes exceed the cube of their difference?

(57.) A merchant bought 450 lbs. of tea at 2s. per lb. Thirty lbs. were lost in the carriage, and 49 lbs. were destroyed. He sold the remainder at 3s. per lb. How much did he gain or lose?

(58.) If a book contain 456 pages, 25 lines in each page, on an average 9 words in each line, and 5 letters in each word, how many letters are there in the whole book?

(59.) One-third of 75 multiplied by the fifth part of 120 will be one-seventh of a certain number. Find the number.

(60.) Jane is now 11 years of age. Five years ago her father was 5 times as old as she was. How old will her father be 10 years hence?

(61.) How many shots will a fleet of 8 ships fire in 36 rounds, two of the ships having 91 guns each, five 74 guns each, and one 59?

(62.) A farmer went to market with £400 in his pocket. He bought 36 oxen at £16 each, and 3 score of sheep at £2 each. He drew £360 from the bank while at the market. How much money did he carry home?

(63.) A cistern contains 7695 gallons. How many gallons must be run off each hour so that it may be emptied in 21 hours?

(64.) A regiment of soldiers was formed into a column, with 52 men on one side and 36 on the other. Supposing they were formed into a column with 49 men on one side, how many would be on the other?

(65.) John gathered 456 nuts, James half as many, Peter half as many again as John, Andrew as many as James and Peter together. How many nuts did they gather among them?

(66.) If 79846 be divided by a certain number, it gives a quotient of 265, with remainder 81. What is the divisor?

(67.) What number is that which, being divided by 52, the quotient increased by 49, the sum diminished by the difference between 36 and 17, the remainder multiplied by 3, and the product divided by 111, the quotient will be 1?

(68.) The product of two numbers is 94583, and the third part of one of them is 17. What is the other number?

(69.) Three men and a boy earned among them 76 shillings. Each man got 6 times as much as the boy. How much did each receive?

(70.) In a garden there were 769 apples on one tree, and 876 on another. The owner gathered 49 daily for 13 days, and then divided the remainder among his 3 sons and 2 daughters, giving to his daughters a son's share between them. How many did each receive?

(71.) From twenty-nine and four-sevenths subtract seventeen and six-sevenths.

(72.) Add thirty-four and four-ninths, six hundred and seventy-nine and three-ninths, eighty-nine and seven-ninths, seventeen and eight-ninths, nine and four-ninths, thirteen and six-ninths.

(73.) $98\frac{4}{11} + 792\frac{5}{11} + 879\frac{8}{11} + 75 + 8973\frac{6}{11} + 7984\frac{7}{11} + 693\frac{10}{11} + 892\frac{4}{11} + 597\frac{10}{11} + \frac{7}{11}$.

(74.) $6709060892745\frac{2}{5} - 4060908645896\frac{7}{5}$.

(75.) John bought $30\frac{1}{4}$ yards of twine to fly his kite; he also received $14\frac{3}{4}$ yards from his father, and $17\frac{3}{4}$ yards from his brother. How many yards had he altogether?

(76.) $4\frac{3}{7} + 5\frac{4}{14} - 6\frac{1}{7} + 1\frac{3}{14} - 4\frac{3}{7}$.

(77.) $6\frac{6}{10} - 4\frac{4}{5} + 3\frac{3}{10} - 2\frac{3}{5}$.

(78.) A draper bought $769\frac{6}{8}$ yards of cloth, and sold $596\frac{5}{8}$ of them. How many has he left?

(79.) Reduce to whole or mixed numbers:—

$\frac{896}{12}$, $\frac{191}{7}$, $\frac{84}{11}$, and $\frac{196}{9}$.

(80.) Express as improper fractions:—$89\frac{3}{4}$, $17\frac{3}{5}$, $42\frac{11}{12}$, and $9\frac{3}{7}$.

(81.) Express 9 as a fraction, with denominator 8; and 8 as a fraction, with denominator 6.

(82.) In a railway train there were $3\frac{3}{5}$ times as many second-class passengers as there were first-class, and a half as many again third-class as there were of first and second together. Now there were 36 first-class passengers. How many were there in the whole train?

(83.) If $2\frac{1}{2}$ yards of cloth are required to make a pair of trousers for a soldier, and $3\frac{3}{4}$ for his coat, how many yards will be required to clothe a regiment of 950 men?

(84.) $\frac{4}{7} \times 3$, $\frac{6}{7} \times 4$, $\frac{6}{7} \div 8$, $\frac{6}{7} \div 5$.

(85.) $4\frac{2}{3} \times 6$, $4\frac{6}{7} \times 6$, $7\frac{3}{8} \div 6$, $6\frac{3}{7} \div 5$.

(86.) A gentleman gave away one Christmas 1749 pence among 12 men and 9 women, giving to each woman one half the number he gave to each man. How many did each receive?

(87.) $\frac{4}{7} \times \frac{8}{9}$, $\frac{2}{5} \times \frac{5}{6}$, $\frac{4}{5} \times \frac{6}{7}$, $\frac{4}{5} \times \frac{7}{8}$.

(88.) $\frac{4}{7} \div \frac{6}{9}$, $\frac{3}{5} \div \frac{6}{7}$, $\frac{4}{5} \div \frac{6}{7}$, $\frac{3}{5} \div \frac{5}{8}$.

(89.) $3\frac{1}{2} \times 4\frac{1}{4}$, $6\frac{3}{5} \times 4\frac{1}{12}$, $4\frac{1}{2} \times 7\frac{3}{4}$.

(90.) $6\frac{7}{8} \div 8\frac{1}{2}$, $8\frac{3}{5} \div 4\frac{5}{8}$, $\frac{6}{7} \div 4\frac{1}{2}$.

(91.) $3\frac{1}{2} \times 6\frac{3}{4} \times \frac{9}{11}$.

(92.) $3\frac{3}{8} \times 7\frac{3}{4} \div 20\frac{9}{11}$.

(93.) At an election the successful candidate had a majority of 471, and 975 votes were registered against him. How many voted altogether?

(94.) What is the difference between $16\frac{7}{8} \times 6$ and $29\frac{5}{8} \times 9$?

(95.) Simplify $\dfrac{21 \times 54 \times 36}{14 \times 108 \times 9}$,

$\dfrac{16 \times 4 \times 15 \times 27}{12 \times 32 \times 10 \times 9}$,

$\dfrac{9 \times 27 \times 14 \times 5}{18 \times 21 \times 15 \times 54}$.

(96.) In a steamboat there were 27 cabin passengers, $\frac{1}{2}$ as many again second cabin passengers, twice as many steerage passengers as there were cabin and second cabin passengers together. How many were there altogether?

(97.) $4893\frac{4}{7} \times 9$, $5674 \times 9\frac{4}{7}$.

(98.) $6842\frac{3}{4} \times 37$, $9754 \times 37\frac{3}{4}$.

(99.) $68954\frac{4}{5} \div 18$, $78976\frac{5}{7} \div 23$. In the first of these two sums find the complete quotient, and in the other the quotient and remainder.

(100.) $64961 \div 5\frac{2}{7}$, $9645 \div 29\frac{4}{7}$. In the first of these two sums find the complete quotient, and in the other the quotient and remainder.

(101.) A gentleman bought a carriage for £275, a pair of horses for $\frac{4}{5}$ of what he gave for the carriage, and a dog for $\frac{3}{11}$ of the price of the carriage. By mistake he sent a cheque for £399 to pay for them. What was the amount of error?

(102.) Simplify $\frac{4\frac{2}{3} \times 5\frac{1}{2}}{3\frac{3}{8}}$.

(103.) Simplify $\frac{\frac{7}{9} + \frac{5}{11}}{\frac{7}{9} - \frac{5}{11}}$.

(104.) Simplify $\frac{\frac{3}{5} - \frac{3}{10}}{\frac{3}{11} + \frac{3}{4}} \div \frac{4\frac{1}{2}}{3}$.

(105.) Divide the sum of $6\frac{2}{3}$ and $4\frac{5}{9}$ by their difference.

(106.) Simplify $\frac{\frac{3}{4} \text{ of } \frac{5}{7}}{3}$, $\frac{3}{\frac{3}{4} \text{ of } \frac{5}{7}}$.

(107.) $\frac{5}{7}$ of $4\frac{2}{5} \div 9\frac{4}{5}$, $\frac{5}{7} \div (4\frac{2}{5} \times 9\frac{4}{5})$.

(108.) If $18\frac{1}{3}$ be $\frac{5}{11}$ of a number, what is the whole number?

(109.) If a man can do $\frac{4}{5}$ of a piece of work in a day, in what time will he do the whole work?

(110.) If a man can do a piece of work in $2\frac{1}{3}$ days, how much of it will he do in 1 day?

(111.) Simplify $\frac{1^4+2^3+3^2}{3^2-2^3+1}$, $\frac{3^3-2^2-1^4}{3^3+2^2+1^4}$.

(112.) From the sum of one-half and one-fifth subtract the half of one-fifth.

(113.) From the product of one-third and one-half subtract the difference between one-third and one-half.

(114.) From the quotient of one-third divided by one-half subtract the product of one-third and one-half.

(115.) Simplify $\frac{1.2}{2.3} + \frac{2.3}{3.4} + \frac{3.4}{4.5} + \frac{4.5}{5.6}$.

(116.) Simplify $\frac{1.2.3}{2.3.4} - \frac{2.3.4}{3.4.5} + \frac{3.4.5}{4.5.6}$.

(117.) Divide the sum of one-fourth and one-fifth by their difference.

COMPOUND RULES.

(*MONEY.*)

MONEY TABLE.

2 Farthings	**make**	**1 Halfpenny** (½*d*).
4 Farthings	**,,**	**1 Penny** (*d*).
12 Pence	**,,**	**1 Shilling** (*s*).
20 Shillings	**,,**	**1 Pound** (*£*).

L. S. D., signifying "Pounds, Shillings, Pence," are the first letters of the words "Libra, Solidus, Denarius," the names of Roman coins.

The coins in use are as follows :—

Gold :—Sovereign (20s.), Half-sovereign (10s.).

Silver :—Crown (5s.), Half-crown (2s. 6d.), Florin (2s.), Shilling (1s.), Sixpence (6d.), Fourpenny-piece or Groat (4d.), Threepenny-piece (3d.).

Copper :—Penny (1d.), Half-penny (½d.), Farthing (¼d.).

Guinea, 21s., a gold coin formerly in use, is now only used as a nominal unit, especially in fees and subscriptions.

Gold is a legal tender to any amount ; Silver to the extent of 40s. ; and Copper to the extent of 12d.

ALIQUOT PARTS.

Of £1.	of 10s.	of 5s.	of 2s. 6d.	of 1s. 3d.	of 1s.
10/ = ½	3/4 = ⅗	...	...	...	...
6/8 = ⅓	2/6 = ¼	= ½	...	...	...
5/ = ¼	1/8 = ⅛	= ⅕	...	...	...
4/ = ⅕	1/3 = ⅙	= ¼	= ½	...	...
3/4 = ⅗	...	/7½ = ⅛	= ⅖	= ½	...
2/6 = ⅛	...	...	/3¾ = ⅛	= ¼	...
2/ = $\frac{1}{10}$	...	...	/2½ = $\frac{1}{12}$	= ⅙	...
1/8 = $\frac{1}{12}$	...	...	...	/1½ = $\frac{1}{10}$	= ⅛
	...	...	...	/1¼ = $\frac{1}{12}$	...

REDUCTION.

Terms to be explained :—*Lower denomination, higher denomination, reduction.*

Mental Exercises.

a. Reduce to halfpence 1½d., 3d., 3½d., &c.
b. ,, to farthings 1½d., 2½d., 3d., 4½d., &c.
c. ,, to pence 1s. 4d., 2s. 3d., 4s. 5d., &c.
d. ,, to pence 7f., 9f., 24f., &c.
e. ,, to shillings 45d., 69d., 74d., &c.
f. ,, to shillings £1, 1s., £2, 4s., £3, 16s., &c.
g. ,, to pounds 49s., 63s., 48s., &c.
h. ,, to pence £1, 4s., £8, £7, 15s., &c.
i. ,, to farthings £1, 10s., £2, 5s., £3, 10s. 6d., &c.
k. ,, to farthings 2 crowns, 3 half-crowns, &c.
l. ,, 10s. to the fraction of £1 ; 5s. to the fraction of £1 ; 1s. to the fraction of 1 crown, &c.

XXXI.

Reduce to shillings :—

(1.) £93 (*ans.* 1860), £476, £874.

(2.) 89 guineas, 768 guineas, 496 guineas.

(3.) 86 half-sovereigns, 98 half-guineas, 896 florins.

(4.) 978 crowns, 1001 half-crowns, 8341 half-crowns.

Reduce to pence :—

(5.) £896 (*ans.* 215040), 896 guineas, 975 half-sovereigns.

(6.) 832 half-crowns, 1111 florins, 439 sovereigns.

Reduce to farthings :—

(7.) £897 (*ans.* 861120), 356 crowns, 1099 half-crowns.

Reduce—

(8.) £987, 13s. to shillings (*ans.* 19753) ; £473, 19s. to shillings ; £856, 11s. to shillings.

(9.) 83 guineas, 13s. to shillings ; 891 crowns, 4s. to shillings ; 813 half-guineas, 9s. to shillings.

(10.) £83, 19s. 6d. to pence ; £742, 13s. 8d. to pence ; £645, 17s. 9d. to pence.

(11.) £916, 13s. 4½d. to farthings (*ans.* 880002) ; £891, 17s. 8d. to farthings ; £813, 1s. 7¼d. to farthings.

(12.) 49 guineas, 13s. 8½d. to farthings; 89 half-sovereigns, 8s. 9¾d. to farthings; 412 crowns, 2s. 7½d. to farthings.

(13.) £47, 13s. 8d. to halfpence; £96, 11s. 4½d. to halfpence; £111, 17s. 9½d. to halfpence.

(14.) 48 half-crowns, 2s. 3½d. to halfpence; 91 half-guineas, 8s. 11½d. to halfpence; 98 sovereigns, 19s. 11½d. to halfpence.

(15.) £981, 17s. 6d. to sixpences; 99 guineas, 13s. 9d. to threepenny-bits; 45 half-crowns, 1s. 8d. to fourpenny-bits.

XXXII.

Reduce—

(1.) 9768 farthings to pence (*ans.* 2442), 4976 farthings to pence, 8761 halfpence to pence.

(2.) 1967 shillings to pounds (*ans.* £98, 7s.), 2898 shillings to pounds, 3976 sixpences to pounds.

(3.) 9876 pence to shillings, 8764 halfpence to shillings, 9781 farthings to shillings.

(4.) 7986-fifths of a penny to pence, 8764-eighths of a penny to pence, 9764-twelfths of a penny to pence.

(5.) 97689 farthings to pounds (*ans.* £101, 15s. 2¼d.), 87642 farthings to pounds, 68324 farthings to pounds.

(6.) 36745 farthings to pounds, 97684 farthings to pounds, 19843 farthings to pounds.

(7.) 98742 halfpence to pounds, 97511 halfpence to pounds, 76489-thirds of a penny to pounds.

(8.) 79841 farthings to half-sovereigns, 73691 halfpence to half-sovereigns, 49693 farthings to sovereigns.

(9.) 68955 farthings to pounds, 768459 farthings to guineas, 964711 halfpence to guineas.

(10.) 51990 threepenny-bits to pounds, 9763 fourpenny-bits to pounds, 896543 pence to sovereigns.

(11.) 450 florins to crowns, 456 florins to half-crowns, 102ᵕ halfpence to half-crowns.

(12.) 960 halfpence to half-guineas, 71 half-crowns, 1s. to half-guineas, 1890 half-guineas to pounds.

(13.) 2499 threepenny-bits to guineas, 80418 farthings to guineas, 89 guineas to pounds.

(14.) 930 guineas, 8s. to pounds, 9768 crowns to guineas, 8764 half-crowns to guineas.

(15.) £1015, 7s. to guineas, 9768 half-crowns, 1s. 6d. to half-guineas, 897 half-crowns to half-guineas.

XXXIII.

Find how often—

(1.) 4s. 5d. is contained in £1, 6s. 6d. (*ans.* 6), 3s. 9d. in £1, 10s., 4s. 11d. in £2, 14s. 1d.

(2.) 2s. 7½d. in £1, 3s. 7½d., 5s. 11¾d. in £3, 11s. 9d., 4s. 9½d. in £4, 11s. 0½d.

(3.) £2, 6s. 7d. in £11, 12s. 11d., £3, 9s. 8¾d. in £31, 7s. 6¾d., £6, 4s. 11¼d. in £68, 14s. 3¾d.

(4.) £3, 6s. 4½d. in £11, 12s. 3¾d., £7, 6s. 9¾d. in £39, 3s., £6, 11s. 2d. in £60, 13s. 3½d.

Reduce the following fractional expressions to their lowest terms :—

(5.) $\frac{3s.}{4s.\ 6d.}$ (*ans.* $\frac{2}{3}$), $\frac{3s.\ 9d.}{4s.\ 6d.}$, $\frac{4s.\ 8\frac{1}{2}d.}{8s.\ 5\frac{1}{4}d.}$

(6.) $\frac{£1,\ 11s.\ 6d.}{£2,\ 7s.\ 3d.}$, $\frac{15s.\ 2\frac{1}{4}d.}{£1,\ 2s.\ 8\frac{1}{4}d.}$, $\frac{£2,\ 7s.\ 5\frac{1}{2}d.}{£3,\ 12s.\ 2\frac{1}{4}d.}$

(7.) $\frac{14s.\ 10\frac{3}{4}d.}{19s.\ 5\frac{3}{4}d.}$, $\frac{9s.\ 2d.}{£1,\ 1s.\ 1d.}$, $\frac{£1,\ 5s.\ 3\frac{1}{4}d.}{£2,\ 7s.\ 3d.}$

Find what fraction—

(8.) 3d. is of 1s. (*ans.* ¼) ; 4d. of 1s. ; 1½d. of 1s.

(9.) 4s. of £1 ; 5s. of £1 ; 2s. 6d. of £1.

(10.) 3s. 4d. of £1 ; 6s. 8d. of £1 ; 1s. 3d. of £1.

(11.) 12s. of £1 ; 15s. of £1 ; 13s. 4d. of £1.

(12.) 10s. of £2 ; 12s. 6d. of £3 ; 17s. 6d. of £4, 10s.

Reduce—

(13.) 3s. 9d. to the fraction of 5s. 7½d. (*ans.* ⅔), £6, 7s. 0½d. to the fraction of £6, 18s. 6d., £4, 6s. 10¼d. to the fraction of £5, 12s. 3¼d.

XXXIV.

(1.) Andrew has £5, 6s. 7½d., and Thomas has £7, 18s. 3d. How much money must Thomas give to Andrew that the latter may have 6000 farthing?

(2.) A gentleman's income is £967. What amount of income-tax must he pay at the rate of 5d. in the £?

(3.) At an entertainment 500 people paid 3d. each, 450 paid 6d. each, and 197 paid 1s. each. What was the amount drawn?

(4.) A French franc is worth 9½d. What is the value in English money of 987 francs?

(5.) An American dollar is worth 4s. 2d. What is the value of 2000 dollars?

(6.) In India 16 annas are equal to one rupee, which is worth 2s. What is the value of 1600000 annas?

(7.) The property of a certain city is valued at £15,000,000. What assessment would be raised at the rate of 7½d. in the £?

(8.) Add together a halfpenny, a penny, a shilling, a crown, a half-crown, a sovereign, a guinea, and a half-guinea, and find how often the amount is contained in £481.

(9.) How many yards at 3s. 5½d. a yard, may be had for £5, 10s.?

(10.) If mutton be 11½d. per lb., and beef 9d. per lb., how many lbs. of mutton must be given for 18 lbs. of beef?

(11.) How many gallons of water must be added to 16 gallons of spirits, at 18s. a gallon, so that the mixture may be sold at 12s. a gallon?

(12.) A man divides £17 among 4 people, so that for every 6d. one gets another gets 5d., another 4d., and another 2d. What does each receive?

COMPOUND ADDITION.

Mental Exercises.

a. ¾d. + 1¼d. + 2d.; 3½d. + 4d. + 7¾d., &c.

b. 1s. 6d. + 2s. 3d. + 5s. 9d.; £4, 10s. + £6, 15s. + £2, 5s., &c.

c. 1 shilling + 1 florin + 1 half-crown; 1 sovereign + 1 guinea + 1 half-guinea, &c.

d. 3d. + 2¼d. + 2½d. + 2¾d., &c.; 4s. + 2s. 9d. + 2s. 9d. + 2s. 9d., &c.; £2 + £3, 15s. + £3, 15s. + £3, 15s., &c.

XXXV.

(1.)

£	s.	d.
96	17	11
49	11	6
54	9	8
37	10	7
42	9	0
£280	18	8

(2.)

£	s.	d.
19	13	8
218	14	5
9	18	7
38	5	11
17	12	10
£304	5	5

(3.)

£	s.	d.
47	11	5
39	18	7¾
19	11	5
42	19	11¼
7	8	10
£157	10	3

(4.)

£	s.	d.
496	18	10
54	13	11½
598	11	10½
49	13	11
54	11	7½
£1254	10	2½

(5.)

£	s.	d.
896	11	5¾
49	5	8½
7	9	11¾
960	0	0½
49	9	7

(6.)

£	s.	d.
756	8	10½
49	11	5½
541	16	8¾
99	13	5
456	11	6½

(7.)

£	s.	d.
856	11	7½
987	14	5¼
872	19	9¾
742	11	5½
89	9	10¾
411	13	7¼

(8.)

£	s.	d.
498	11	5¼
219	13	4½
721	15	6¾
87	14	7¼
519	17	8½
911	19	5

(9.)

£	s.	d.
489	19	11¼
568	17	10¾
897	13	5½
476	14	7¼
893	13	5¾
742	19	11¼

(10.)

£	s.	d.
974	13	11½
39	11	4½
8	17	0¼
42	19	7½
0	18	10¾
876	1	1½

(11.)

£	s.	d.
548	11	5
897	16	4½
798	13	5¾
894	11	6¼
742	19	7½
421	11	5¼

(12.)

£	s.	d.
211	13	4½
910	17	5½
19	9	9¾
4211	5	11¼
897	13	4½
876	14	10¾

(13.)

£	s.	d.
769	18	5½
421	13	6¼
986	14	7½
874	13	5¾
976	18	7½
497	13	5¼
764	11	11¾

(14.)

£	s.	d.
742	11	11¼
968	13	5½
421	14	7¼
384	11	5½
421	9	6¾
824	10	10¼
874	11	5

(15.)

£	s.	d.
789	11	5¼
39	17	4¼
87	0	10½
19	13	0¾
916	17	6
496	18	11
987	9	10

(16.)

£	s.	d.
874	19	5½
421	13	6¼
54	18	7¾
896	9	9¼
6	11	4½
19	13	0¼
38	14	11½

(17.)

£	s.	d.
549	8	5
656	9	11¼
872	13	9¼
54	11	5½
876	14	7¾
98	13	5½
9	0	11¾

(18.)

£	s.	d.
849	17	6¼
569	18	11½
49	16	7¾
0	18	11½
568	13	9¾
1456	11	5½
987	18	6¾

(19.)

£	s.	d.
118	19	7¾
49	13	11¼
984	17	8¾
782	13	5½
99	18	7½
84	19	11¼
49	7	5¾
98	9	8½
849	16	7½
89	13	6¼
641	9	11
98	16	7¼
967	14	5
4897	19	9¾
57	16	7½
109	10	11¾

(20.)

£	s.	d.
74	13	5½
896	14	6¾
97	11	5½
74	13	6¾
981	14	5½
674	19	10¾
1984	13	7½
9842	17	6¼
6984	13	5½
6742	14	6¾
981	13	11½
89	17	4¼
764	13	5½
9876	14	11¾
898	13	5½
541	9	10

(21.)

£	s.	d.
421	11	11½
543	16	9¼
9876	13	4½
989	17	6¼
548	13	7½
9876	14	11¾
896	0	10¼
987	16	11¾
876	14	9¼
49	13	5¼
38	17	6¾
842	11	11½
49	13	6¾
1496	17	7½
8942	0	11¼
9768	13	4½

(22.)

£	s.	d.
496	13	$5\frac{1}{2}$
8979	14	$11\frac{1}{2}\frac{8}{9}$
764	11	$5\frac{1}{4}$
49	19	$6\frac{1}{2}\frac{8}{9}$
147	16	8
97	17	$9\frac{1}{4}\frac{7}{8}$
546	19	$8\frac{1}{2}$
498	13	$5\frac{3}{4}\frac{1}{2}$
£11582	7	$0\frac{3}{4}\frac{3}{8}$

(23.)

£	s.	d.
2483	16	$7\frac{1}{2}$
974	19	$5\frac{1}{4}\frac{2}{3}$
69	18	$11\frac{1}{2}\frac{2}{3}$
45	19	$6\frac{1}{4}$
896	13	7
1483	14	$11\frac{1}{2}\frac{5}{6}$
987	16	$5\frac{1}{4}\frac{7}{9}$
99	19	$9\frac{3}{4}\frac{1}{3}$

(24.)

£	s.	d.
9876	11	$5\frac{1}{2}\frac{9}{12}$
4978	19	$6\frac{1}{4}$
989	13	$7\frac{3}{4}\frac{1}{11}$
87	11	$11\frac{1}{4}$
9811	13	$4\frac{3}{4}\frac{4}{11}$
519	17	$8\frac{1}{2}$
421	14	$7\frac{1}{4}\frac{7}{12}$
54	19	$8\frac{3}{4}$

(25.) £49, 16s. $11\frac{3}{4}\frac{11}{14}$ + £87, 16s. $5\frac{1}{2}\frac{3}{7}$ + £4, 13s. $8\frac{1}{2}\frac{5}{7}$ + £98, 16s. $7\frac{1}{2}$ + £198, 17s. $9\frac{3}{4}\frac{9}{16}$ + £987, 14s. $7\frac{1}{4}$ + £876, 15s. $6\frac{3}{4}\frac{2}{7}$ + £1984, 13s. $5\frac{1}{2}\frac{3}{7}$ + £9842, 16s. $7\frac{1}{2}$.

(26.) £4697, 13s. $8\frac{1}{2}$ + £598, 19s. $7\frac{3}{4}\frac{1}{5}$ + £497, 16s. $8\frac{1}{2}\frac{3}{4}$ + £98, 17s. $6\frac{1}{4}\frac{1}{2}$ + £987, 16s. $4\frac{3}{4}$ + £9861, 14s. $7\frac{1}{4}\frac{3}{4}$ + £989, 16s. $7\frac{1}{2}\frac{7}{12}$ + £421, 14s. $11\frac{3}{4}$ + £986, 11s. $1\frac{1}{2}\frac{5}{12}$.

(27.) £7984, 13s. $5\frac{1}{2}\frac{3}{16}$ + £987, 16s. $11\frac{1}{4}\frac{3}{8}$ + £98, 19s. $7\frac{3}{4}$ + £872, 1s. $4\frac{1}{2}\frac{11}{16}$ + £8976, 14s. $10\frac{1}{4}\frac{4}{5}$ + £989, 16s. $9\frac{1}{2}$ + £99, 19s. $9\frac{3}{4}\frac{7}{10}$ + £421, 11s. $4\frac{1}{2}\frac{1}{5}$ + £97, 16s. $11\frac{1}{4}\frac{8}{5}$.

(28.) £4897, 16s. $7\frac{1}{2}\frac{3}{11}$ + £423, 17s. $8\frac{3}{4}\frac{4}{11}$ + £98, 13s. $7\frac{1}{4}\frac{5}{22}$ + £8931. 9s. $10\frac{1}{2}\frac{4}{11}$ + £986, 13s. $5\frac{1}{2}\frac{9}{12}$ + £16, 19s. $11\frac{3}{4}$ + £35, 16s. $2\frac{1}{2}$ + £617, 19s. $8\frac{3}{4}\frac{7}{11}$.

(29.) £896, 17s. $8\frac{1}{2}\frac{2}{5}$ + £768, 13s. $7\frac{1}{2}$ + £8734, 11s. $10\frac{1}{2}\frac{11}{13}$ + £961, 13s. $5\frac{3}{4}\frac{7}{9}$ + £654, 17s. $6\frac{1}{4}\frac{7}{18}$ + £769, 13s. $5\frac{1}{2}\frac{5}{6}$ + £83, 11s. $7\frac{3}{4}\frac{7}{9}$ + £641, 13s. $8\frac{1}{2}\frac{5}{6}$ + £84, 11s. $11\frac{1}{2}\frac{5}{6}$ + £16, 19s. $8\frac{1}{2}\frac{2}{5}$.

(30.) £7911, 11s. $11\frac{1}{4}\frac{6}{17}$ + £896. 7s. $6\frac{1}{2}\frac{1}{13}$ + £97, 18s. $7\frac{3}{4}\frac{1}{2}$ + £983, 19s. $6\frac{1}{2}\frac{5}{13}$ + £998, 1s. $7\frac{1}{4}$ + £9876, 16s. 9 + £8381, 17s. $10\frac{1}{2}\frac{5}{6}$ + £931, 11s. $0\frac{1}{4}$ + £674, 19s. $11\frac{3}{4}\frac{7}{13}$ + £1479, 5s. $9\frac{1}{2}\frac{3}{4}$.

(31.) £541, 16s. $8\frac{1}{2}\frac{4}{13}$ + £89, 17s. $10\frac{1}{4}\frac{5}{16}$ + £989, 19s. $11\frac{3}{4}\frac{7}{13}$ + £96, 1s. $7\frac{1}{2}\frac{5}{16}$ + £741, 11s. $11\frac{1}{4}$, £819, 11s. $10\frac{1}{2}\frac{11}{23}$ + £54, 17s. $8\frac{1}{2}\frac{5}{13}$ + £961, 11s. $10\frac{1}{4}\frac{6}{13}$ + £89, 9s. $9\frac{3}{4}\frac{7}{13}$ + £76, 11s. $7\frac{1}{2}$.

(32.) £67, 16s. $7\frac{1}{4}\frac{3}{5}$ + £916, 18s. $9\frac{1}{2}$ + £89, 11s. $10\frac{3}{4}\frac{2}{5}$ + £918, 16s. $11\frac{1}{4}\frac{7}{10}$ + £9876, 17s. $10\frac{1}{2}\frac{11}{15}$ + £617, 11s. $11\frac{1}{2}\frac{3}{5}$ + £9816, 19s. 10 + £987, 17s. $11\frac{1}{4}\frac{4}{5}$ + £742, 9s. $10\frac{1}{2}\frac{1}{10}$ + £869, 17s. 9.

(33.) £918, 13s. $5\frac{1}{2}$ + £1678, 14s. 10d. + £989, 13s. $5\frac{1}{4}\frac{7}{17}$ + £98, 13s. $10\frac{3}{4}\frac{8}{17}$ + £643, 9s. $8\frac{1}{2}\frac{11}{17}$ + £96, 18s. $7\frac{1}{4}\frac{9}{14}$ + £8745, 13s. $11\frac{1}{2}\frac{3}{14}$ + £986, 11s. $5\frac{1}{4}$ + £498, 13s. $8\frac{1}{2}\frac{7}{17}$ + £561, 9s. $10\frac{1}{4}\frac{3}{17}$.

XXXVI.

(1.) Add together the following sums :—Seven thousand four hundred and twenty-one pounds eleven shillings elevenpence farthing and two nineteenths ; eight hundred and ninety-seven pounds ten shillings sixpence halfpenny and eleven nineteenths ; ninety-eight pounds nine shillings sevenpence farthing and five thirty-eighths ; seven hundred and sixty-one pounds seventeen shillings eightpence halfpenny and four nineteenths, ninety-eight pounds thirteen shillings elevenpence farthing and three nineteenths ; eight thousand nine hundred and seventy-six pounds eleven shillings elevenpence farthing and seven thirty-eighths ; eight hundred and eighty-eight pounds eighteen shillings eightpence halfpenny and eight nineteenths ; nine thousand six hundred and fourteen pounds eleven shillings and ninepence farthing ; nine hundred and sixty-one pounds one shilling tenpence and five thirty-eighths ; one thousand six hundred and seventy-eight pounds nineteen shillings and sevenpence halfpenny.

(2.) Find the amount of the following sums :—Four hundred and eleven pounds thirteen shillings fivepence halfpenny and four-fifths ; nine thousand eight hundred and seventy-six pounds fourteen shillings tenpence farthing and three twenty-fifths ; eight hundred and ninety-seven pounds thirteen shillings fivepence halfpenny and one-fifth ; sixty-nine pounds nine shillings tenpence farthing and eleven-fiftieths ; nine hundred and sixty-four pounds thirteen shillings sevenpence halfpenny and nineteen twenty-fifths ; eight hundred and seventy-six pounds thirteen shillings and tenpence farthing ; nine thousand one hundred and sixty-seven pounds fourteen

shillings elevenpence halfpenny and three twenty-fifths; eight hundred and ninety-eight pounds thirteen shillings fourpence farthing and seven-tenths; seven hundred and sixty-one pounds nine shillings; eight thousand seven hundred and thirty-eight pounds tenpence halfpenny and eleven twenty-fifths.

Find the amounts of the following :—

(3.) 29 threepenny bits, 87 fourpenny bits, 95 sixpences, and 485 halfpence.

(4.) 897 farthings, 684 pence, 497 halfpence, and 75 shillings.

(5.) 976 shillings, 89 florins, 67 half-sovereigns, and 83 sovereigns.

(6.) 984 crowns, 59 half-crowns, 48 florins, and 45 pounds.

(7.) £896, 451 guineas, 832 half-guineas, and 56 half-sovereigns.

(8.) 989 half-guineas, 856 half-crowns, 764 half-sovereigns, and 976 halfpence.

(9.) A shopkeeper sold on Monday goods to the value of £7, 18s. 6d., on Tuesday, £5, 13s. 7½d., on Wednesday, £11, 19s. 6¾d., on Thursday, £11, 14s., on Friday, £12, 9s. 0½d., and on Saturday, £29, 13s. 11¼d. What were his total sales for the week?

(10.) A gentleman derives his income from the following sources :—£760 from the public stocks, £650, 19s. from railway shares, £307, 18s. from land, £219, 13s. 6d. from other property, and £19. 17s. 6½d. from interest of money in the bank. What is the amount of his income?

(11.) A joint-stock company pays away in the course of the year the following sums :—Rents and public burdens, £216, 19s., insurance on stock, £27, 14s. 7d., travelling expenses, £456, 19s. 7½d., salaries, £3676, 17s., cleaning, £11, 13s. 9d., advertising and printing, £376, 18s. 9d., incidental expenses, £79, 18s. 3½d. What is the amount of expenditure?

(12.) A merchant at the beginning of a year had a capital of £8496, 17s. 8d. At the end of January he banked £768, 14s. 5d., and had £39, 17s. 8½d. of interest

added to his account; at the end of April he banked £989, 13s., and had £98, 17s. 8¾d. of interest added; at the end of June £68, 14s., and had £179, 13s. 4d of interest added; and at the end of the year £896, 17s., and had £576, 19s. 7½d. of interest added. What was his capital then?

COMPOUND SUBTRACTION.

Mental Exercises.

a. 5½d.—2¾d., 7½d.—3½d., 2s. 6d.—1s. 9d, 7s. 3d.—4s. 5s., &c.

b. From 1s. 6d. subtract 2½d., then 2½d. from the remainder, and similarly till the last remainder is less than 2½d. In like manner from 8s. subtract 1s. 3d.; from £5 subtract £1, 3s., &c.

c. What change should be received in paying 3½d. out of 1s., 1s. 2½d. out of a florin, 1s. 9½d. out of half-a-crown? &c.

XXXVII.

(1.)

£	s.	d.
89	16	8
69	13	5
20	3	3

(2.)

£	s.	d.
106	11	9
98	9	7
8	2	2

(3.)

£	s.	d.
986	19	11¾
97	13	8½
889	6	3¼

(4.)

£	s.	d.
456	13	5½
198	11	4
258	2	1½

(5.)

£	s.	d.
972	11	5½
968	7	6¼
4	3	11¼

(6.)

£	s.	d.
849	16	4½
672	17	2¼
176	19	2¼

(7.)

£	s.	d.
897	13	8¼
589	11	6½

(8.)

£	s.	d.
687	11	5½
596	8	7¾

(9.)

£	s.	d.
578	13	6½
499	15	7¾

(10.)

£	s.	d.
864	18	$11\frac{1}{4}$
576	19	$8\frac{3}{4}$

(11.)

£	s.	d.
847	19	$11\frac{1}{2}$
596	13	$11\frac{3}{4}$

(12.)

£	s.	d.
768	13	$5\frac{3}{4}$
479	15	$5\frac{1}{2}$

(13.)

£	s.	d.
876	15	$7\frac{1}{4}$
798	14	$9\frac{1}{4}$

(14.)

£	s.	d.
841	0	10
656	0	$11\frac{1}{2}$

(15.)

£	s.	d.
8498	11	$4\frac{1}{2}$
6596	0	0

(16.)

£	s.	d.
9761	0	0
8964	1	$1\frac{1}{4}$

(17.)

£	s.	d.
8764	13	$5\frac{1}{2}$
876	14	$9\frac{3}{4}$

(18.)

£	s.	d.
4156	11	$4\frac{1}{4}$
99	19	$9\frac{3}{4}$

(19.)

£	s.	d.
1549	1	$1\frac{1}{4}$
987	2	$2\frac{3}{4}$

(20.)

£	s.	d.
8765	13	8
976	11	$9\frac{1}{2}$

(21.)

£	s.	d.
8764	19	$6\frac{1}{4}$
989	19	$9\frac{1}{2}$

(22.) £4111, 11s. $11\frac{1}{4}$ — £1234, 12s. $11\frac{1}{2}$.

(23.) £8976, 14s. $5\frac{1}{4}$ — £19, 18s. 6.

(24.) £8888, 18s. 8 — £999, 19s. $9\frac{3}{4}$.

(25.) £89, 13s. $7\frac{1}{2}\frac{1}{4}$ — £64, 19s. $8\frac{3}{4}\frac{9}{10}$. *Ans.* £24, 13s. $10\frac{1}{2}\frac{9}{10}$.

(26.) £87, 14s. $11\frac{1}{2}\frac{3}{5}$ — £69, 11s. $11\frac{3}{4}\frac{7}{9}$.

(27.) £641, 15s. $9\frac{1}{2}\frac{3}{5}$ — £98, 16s. $9\frac{1}{4}\frac{7}{10}$.

(28.) £742, 11s. $8\frac{1}{2}\frac{7}{9}$ — £69, 19s. $11\frac{1}{4}\frac{11}{12}$.

(29.) £8961, 13s. $11\frac{1}{4}\frac{1}{2}$ — £876, 11s. $11\frac{3}{4}\frac{7}{12}$.

(30.) £6715, 11s. $4\frac{1}{2}\frac{9}{13}$ — £876, 14s. $9\frac{3}{4}\frac{1}{12}$.

(31.) £876, 14s. $11\frac{1}{4}\frac{1}{4}$ — £698, 15s. $9\frac{1}{2}\frac{3}{5}$.

(32.) £798, 15s. $6\frac{3}{4}\frac{7}{11}$ — £698, 16s. $7\frac{1}{2}\frac{8}{11}$.

(33.) £1149, 11s. $7\frac{9}{4}\frac{5}{12}$ — £978, 15s. $11\frac{1}{4}\frac{3}{5}$.

(34.) £6459, 19s. $6\frac{1}{2}$ — £1976, 16s. $9\frac{3}{4}\frac{4}{9}$.

(35.) £8974, 9s. $0\frac{1}{4}\frac{5}{11}$ — £8798, 13s. $1\frac{1}{2}$.

(36.) *From* five thousand seven hundred and sixty-one pounds eleven shillings ninepence threefarthings and four twenty-sixths *take* four thousand nine hundred and eighty-seven pounds nineteen shillings one penny farthing and seven-thirteenths.

(37.) *What is the difference between* four thousand eight hundred and seventy-one pounds nine shillings elevenpence farthing and five-seventeenths *and* three thousand nine hundred and eighty-two pounds fourteen shillings threefarthings and nine thirty-fourths?

(38.) *What is the difference between* four thousand nine hundred and eighty-seven pounds eleven shillings ninepence threefarthings and thirteen nineteenths *and* five thousand seven hundred and sixty-nine pounds thirteen shillings fivepence halfpenny and eleven thirty-eighths?

(39.) By how much is one thousand and nine pounds *greater than* nine hundred and eighty-seven pounds nineteen shillings elevenpence threefarthings and five-sixths?

Find the value of—

(40.) £89, 16s. $7\frac{1}{2}$ + £35, 14s. 11 — £89, 17s. 6 + £42, 13s. — £76, 13s. $5\frac{1}{2}$.

(41.) £42, 19s. $11\frac{3}{4}$ — £99, 18s. $7\frac{1}{4}$ + £101, 0s. $10\frac{1}{2}$ + £9, 17s. 6 — £36, 13s. $8\frac{3}{4}$.

(42.) £36, 19s. $7\frac{1}{3}\frac{5}{13}$ — £84, 17s. $6\frac{1}{4}\frac{3}{11}$ + £72, 11s. $9\frac{3}{4}\frac{9}{11}$ — £69, 13s. $5\frac{0}{4}\frac{6}{13}$ + £89, 13s. 8.

XXXVIII.

(1.) 15 guineas — £11, 11s.

(2.) 25 half-guineas — £9, 9s.

(3.) £17, 11s. $6\frac{1}{2}$ — 11gs. 14s. $5\frac{1}{4}$.

(4.) 99 half-sovereigns — 42gs. 13s. $6\frac{1}{4}$.

(5.) 17 guineas — 11 half-crowns + 13 half-sovereigns + 96 half-guineas — 45 crowns — 82 halfpence + 42 thirds of a penny.

(6.) John said to James, If you give me 17s. $6\frac{1}{2}$d. I shall have 19s. $11\frac{3}{4}$d. James replied, If you give me all the

money you have I shall have £2. How much money had each of them?

(7.) Andrew got a present of 3 half-sovereigns. He bought a book for 7s. 9d., and then 4½d. worth of twine, but by mistake gave one of his half-sovereigns instead of a sixpence in paying for the twine. How much money had he left?

(8.) A has in his pocket £5, 11s. 6½d., and B has in his £4, 19s. 6d. If A give to B £3, 18s. 6½d., and B give to A £4, 13s., who will have most, and by how much?

(9.) What sum must I add to £475, 19s. 7½d. to make up 500 guineas?

(10.) A lady went to market with a £10-note and bought 11 lbs. of beef for 10s. 1d., 7 lbs. of mutton for 5s. 3d., 2 stones of potatoes for 1s. 4d., and paid an account of £5, 11s. 9½d. How much money did she take home after paying a cab fare of 1s. 6d. and 9d. to a porter?

(11.) A farmer gave 2 oxen worth £15, 10s. each, and a horse valued at £36, in exchange for 2 cows worth £12, 15s. each, and a cheque for the remainder. What was the value of the cheque?

(12.) A piano, mat, and stool cost £50. The piano and stool together cost £49, 18s. 2d.; the piano and mat together £48, 16s. 4d.; what was the price of each of these articles separately?

COMPOUND MULTIPLICATION.

Mental Exercises.

a. To find the price of a dozen articles, the price of 1 being given: Reckon each 1d. as 1s., and each farthing as 3d.; thus, 12 @ 7¾d. = 7s. 9d. What is the price of 12 articles @ ¾d., 1¼d., 5¼d.? &c.

b. To find the price of a gross, the price of 1 being given: Find the price of 12 by the preceding rule, and again the price of 12 at the price thus found; thus, 144 @ 2¾d., 12 @ 2¾d. = 2s. 9d., and 12s. @ at 2s. 9d. = £1, 13s. What is the price of a gross @ 1¼d., 2¼d., 5¼d.? &c.

c. To find the price of a score, the price of 1 being given: Reckon each 1s. as £1, 3d. as 5s., 1d. as 1s 8d., and ¼d.

as 5d. ; thus, 20 @ 4s. 7½d. = £4, 12s. 6d. What is the price of 20 @ 2½d., 4¾d., 6¼d. ? &c.

d. To find the price of 100, the price of 1 being given : Consider the number of farthings in the price as so many pence and twice as many shillings ; thus, 100 @ 4½d. = 36s. + 1s. 6d. = 37s. 6d. What is the price of 100 @ 3¾d., 7¼d., 9d. ? &c.

e. To find the price of any number of articles : Consider the number of shillings or pence in the price as the number of articles, and the number of articles as the number of shillings or pence ; thus, 472 @ 3d. = 3 @ 472d. = £5, 18s. What is the price of 360 @ 4d., 540 @ 4s. ? &c.

f. 1d. a-day = £1, 10s. 5d. in a year, or (not including Sundays) £1, 6s. 1d. ¼d. a-day = 7s. 7½d. in a year, or (not including Sundays) 6s. 6¼d. What does 3d. a-day amount to in a year ? &c. What does ¾d. a-day amount to in a year ? &c.

XXXIX.

(1.) £89, 7s. 4 × 2 = £178, 14s. 8.
(2.) £96, 8s. 3½ × 2 = £192, 16s. 7.
(3.) £75, 9s. 7¾ × 2 = £150, 19s. 3½.
(4.) £87, 3s. 10¼ × 3 = £261, 11s. 6¾.
(5.) £64, 11s. 4¾ × 3 = £193, 14s. 2¼.
(6.) £84, 15s. 6½ × 4 = £339, 2s. 2.

(7.) £79, 16s. 11¾ × 4.
(8.) £65, 17s. 9½ × 5.
(9.) £69, 11s. 11¾ × 5.
(10.) £97, 13s. 8½ × 6.
(11.) £198, 11s. 4¾ × 6.
(12.) £964, 0s. 11½ × 7.
(13.) £842, 19s. 0¼ × 8.
(14.) £769, 17s. 11 × 9.
(15.) £897, 15s. 8½ × 10.
(16.) £976, 14s. 11¼ × 11.
(17.) £865, 11s. 10¾ × 12.
(18.) £986, 13s. 5½ × 11.
(19.) £769, 17s. 7¾ × 10.
(20.) £895, 13s. 8½d. × 12.

(21.) £876, 14s. 5½ $\frac{4}{5}$ × 9.
(22.) £698, 11s. 4¾ $\frac{5}{7}$ × 8.
(23.) £989, 13s. 8½ $\frac{7}{11}$ × 10.
(24.) £876, 14s. 11¾ $\frac{5}{9}$ × 11.
(25.) £643, 18s. 9¼ $\frac{7}{12}$ × 12.
(26.) £897, 17s. 10¼ $\frac{5}{13}$ × 7.
(27.) £964, 13s. 11½ $\frac{7}{10}$ × 11.
(28.) £843, 9s. 8¾ $\frac{6}{7}$ × 12.
(29.) £878, 13s. 4½ $\frac{5}{11}$ × 10.

XL.

(1.) £67, 14s. $11\frac{1}{2}$ × 14, 16, 18. *Ans.* £948, 9s. 5; £1083, 19s. 4; £1219, 9s. 3.

(2.) £98, 11s. $5\frac{3}{4}$ × 15, 22, 21.

(3.) £78, 19s. $6\frac{1}{2}$ × 24, 32, 44.

(4.) £89, 13s. $11\frac{1}{4}$ × 27, 28, 25.

(5.) £78, 11s. $10\frac{1}{2}$ × 33, 48, 35.

(6.) £89, 17s. $11\frac{3}{4}$ × 36, 45, 54.

(7.) £89, 17s. $6\frac{1}{2}$ × 55, 42, 49.

(8.) £101, 13s. $8\frac{1}{4}$ × 66, 56, 84.

(9.) £896, 11s. $11\frac{3}{4}$ × 72, 64, 81.

(10.) £783, 12s. $10\frac{1}{2}$ × 63, 88, 99.

(11.) £654, 13s. $8\frac{1}{4}$ × 77, 96, 121.

(12.) £897, 11s. 10 × 108, 132, 144.

(13.) £678, 14s. $5\frac{3}{4}$ × 70, 80, 90.

(14.) £899, 19s. $9\frac{1}{2}$ × 100, 110, 120.

(15.) £689, 13s. $11\frac{3}{4}$ × 1000, 1100, 1200.

(16.) £897, 13s. $5\frac{1}{6}\frac{2}{3}$ × 27, 36, 48.

(17.) £968, 11s. $11\frac{3}{4}\frac{1}{5}$ × 60, 96, 84.

(18.) £768, 13s. $5\frac{1}{2}\frac{5}{6}$ × 35, 54, 90.

(19.) £8147, 16s. $11\frac{1}{4}\frac{4}{7}$ × 49, 80, 63.

(20.) £7658, 19s. $11\frac{3}{4}\frac{3}{11}$ × 84, 108, 144.

XLI.

(1.) £25, 18s. $4\frac{1}{2}$ × 13, 17, 19. *Ans.* £336, 18s. $10\frac{1}{2}$; £440, 12s. $4\frac{1}{2}$; £492, 9s. $1\frac{1}{2}$.

(2.) £31, 11s. $5\frac{1}{4}$ × 23, 29, 31.

(3.) £19, 0s. $9\frac{3}{4}$ × 37, 41, 53.

(4.) £37, 19s. $4\frac{1}{4}$ × 39, 43, 57.

(5.) £49, 17s. $6\frac{3}{4}$ × 47, 59, 61.

(6.) £168, 11s. $7\frac{1}{2}$ × 65, 71, 83.

(7.) £21, 17s. $11\frac{3}{4}$ × 67, 73, 89.

(8.) £39, 18s. $10\frac{1}{4}$ × 69, 78, 91.
(9.) £17, 16s. $4\frac{1}{2}$ × 97, 243, 567.
(10.) £13, 11s. $9\frac{3}{4}$ × 354, 467, 548.
(11.) £14, 8s. 9 × 437, 652, 109.
(12.) £19, 13s. $5\frac{3}{4}$ × 679, 708, 504.
(13.) £21, 11s. $7\frac{1}{2}$ × 908, 700, 805.
(14.) £37, 18s. $11\frac{1}{3}$ × 2354, 6708.
(15.) £11, 13s. $5\frac{1}{4}$ × 3576, 8743.
(16.) £13, 0s. $11\frac{1}{2}$ × 4783, 5682.
(17.) £21, 19s. $0\frac{3}{4}$ × 6842, 9876.
(18.) £14, 11s. $9\frac{1}{2}$ × 9008, 7603.
(19.) £14, 11s. $11\frac{1}{4}$ × 7000, 1111.
(20.) £17, 16s. $4\frac{1}{2}$ × 7849, 9876.

(21.) £25, 11s. $4\frac{1}{4}\ \frac{4}{5}$ × 39, 47, 53.
(22.) £49, 18s. $3\frac{3}{4}\ \frac{5}{7}$ × 43, 57, 61.
(23.) £67, 11s. $8\frac{1}{4}\ \frac{6}{7}$ × 79, 86, 95.
(24.) £38, 11s. $4\frac{1}{2}\ \frac{11}{12}$ × 837, 421, 546.
(25.) £35, 19s. $8\frac{3}{4}\ \frac{17}{18}$ × 897, 421, 900.

XLII.

(1.) In a certain factory there were 275 men employed at an average weekly wage of £1, 4s. 6d., 157 women at an average wage of 15s. $6\frac{1}{2}$d., and 39 boys at an average wage of 2s. 6d. What amount was paid for wages in a year of 52 weeks?

(2.) At a fair a farmer sold 23 oxen at £17, 10s. each, and 3 score of sheep at 35s. each. Before he left he banked £60, 15s., and bought a horse for £43, 10s. How much money did he carry home?

(3.) A gentleman's income is £750, 10s. What amount of income-tax will he pay at 5d. per £?

(4.) A merchant having become bankrupt can only pay 13s. $7\frac{1}{2}$d. in the £. What will a creditor receive for a debt of £946?

(5.) A drover bought 650 sheep at 37s. each, and 320 lambs at 12s. 6d. each. The sheep he resold at 39s. 6d. each, but the lambs, after 5 had died, he had to resell at 10s. each. How much did he gain or lose by the transaction?

(6.) What does a person save in a year of 365 days if he earn daily on an average 15s. 7½d. and spend 11s. 2¼d.?

(7.) A manufacturer sells 275 yards of cloth at 17s. 6d. per yard, and receives in exchange 3000 lbs. of wool at 1s. 2½d. per lb., and the rest in money. How much money does he receive?

(8.) A's income is £175, 15s., and B's is 7 times as great, and £29, 15s. besides. What is the amount of B's income after paying income-tax at 6½d. in the £?

(9.) In a school of 345 children ⅗ of them pay 12s. 6d. per quarter, and ⅖ of them 10s. per quarter. What is the whole income derived from the school in a session of 4 quarters after paying £500 for rent and salaries?

(10.) A cattle dealer bought 900 sheep for 27s. 9d. each. During their transit to a foreign port 25 of them died, for each of which he received 5s. 6d. The rest he resold at an advance of 3s. 7d. on the price of every 5 sheep. What did his profits amount to?

(11.) A broker bought £750 worth of stock for a gentleman, and for his trouble charged 2s. 6d. on every £100 worth of stock. He then resold it for the same party for £900, and made the same charge. What sum did he realise for himself by the transaction?

(12.) A St Petersburg silver ruble is equal in value to 3s. 1d. sterling. What amount of English money will pay a debt of 2000 silver rubles?

COMPOUND DIVISION.

Mental Exercises.

a. To find the price of 1, the price of a dozen being given: Reckon each shilling as 1d., and 3d. as ¼d.; thus, if 12 cost 3s. 9d., what will 1 cost? 3¾d. If 12 cost 5s. 6d., what will 1 cost? &c.

b. The price of a gross being given, to find the price of 1: Apply the above rule, and then divide by 12; thus, if 144 cost 30s., what will 1 cost? 1 dozen cost 30d., or 2s. 6d., and therefore 1 will cost $2\frac{1}{2}$d. If 144 cost 42s., what will 1 cost? &c.

c. The price of a score being given, to find the price of 1: Reckon each £1 as 1s., 5s. as 3d., and 5d. as $\frac{1}{2}$d.; thus, if 20 cost £5, 16s. 8d., what will 1 cost? 5s. + 9d. + 1d. = 5s. 10d. If 20 cost £12, 18s. 4d., what will 1 cost? &c.

d. $4\frac{1}{2}$d., 5d., $7\frac{1}{2}$d. ÷ 2, &c. 5s. 6d., 7s. 9d., 8s. 4d. ÷ 3, &c.

XLIII.

In the following find the complete quotient:—

(1.) £42, 18s. 6 ÷ 2 = £21, 9s. 3.

(2.) £36, 14s. 9 ÷ 2 = £18, 7s. $4\frac{1}{2}$.

(3.) £72, 16s. 8 ÷ 3 = £24, 5s. $6\frac{2}{3}$.

(4.) £85, 17s. 9 ÷ 3 = £28, 12s. 7.

(5.) £97, 13s. $11\frac{1}{4}$ ÷ 4 = £24, 8s. $5\frac{3}{4}$.

(6.) £69, 9s. $7\frac{1}{2}$ ÷ 4 = £17, 7s. $4\frac{3}{4}$.

(7.) £87, 11s. $4\frac{3}{4}$ ÷ 5.

(8.) £76, 13s. $5\frac{1}{2}$ ÷ 6.

(9.) £59, 14s. $9\frac{3}{4}$ ÷ 7.

(10.) £67, 13s. $8\frac{1}{4}$ ÷ 8.

(11.) £98, 19s. $11\frac{3}{4}$ ÷ 9.

(12.) £109, 17s. 6 ÷ 10.

(13.) £674, 13s. $8\frac{1}{2}$ ÷ 11.

(14.) £978, 14s. 11 ÷ 12.

(15.) £645, 11s. $9\frac{3}{4}$ ÷ 9.

Find the quotient and remainder:—

(16.) £897, 13s. $11\frac{1}{4}$ ÷ 7.

Ans £128, 4s. 10 + $1\frac{1}{4}$.

(17.) £643, 11s. $4\frac{1}{4}$ ÷ 11.

(18.) £587, 0s. $10\frac{1}{4}$ ÷ 12.

(19.) £976, 0s. $0\frac{3}{4}$ ÷ 10.

(20.) £840, 11s. $11\frac{1}{2}$ ÷ 11.

Find the complete quotient:—

(21.) £647, 11s. $5\frac{1}{2}\ \frac{3}{8}$ ÷ 9.

Ans. £71, 19s. $0\frac{1}{2}\ \frac{14}{17}$.

(22.) £563, 18s. $11\frac{1}{4}\ \frac{5}{6}$ ÷ 11.

(23.) £421, 9s. $0\frac{3}{4}\ \frac{4}{5}$ ÷ 12.

(24.) £876, 0s. $10\frac{1}{2}\ \frac{7}{8}$ ÷ 7.

(25.) £842, 10s. $0\frac{1}{4}\ \frac{3}{11}$ ÷ 12.

(26.) £978, 13s. $10\frac{3}{4}\ \frac{9}{13}$ ÷ 11.

Find the quotient and remainder:—

(27.) £670, 7s. $2\frac{1}{4}\ \frac{18}{19}$ ÷ 10.

Ans. £67, 0s. $8\frac{1}{2} + 1\frac{1}{4}\ \frac{18}{19}$.

(28.) £801, 1s. $1\frac{1}{4}\ \frac{1}{7}$ ÷ 9.

(29.) £711, 11s. $11\frac{1}{2}\ \frac{11}{12}$ ÷ 12.

(30.) £810, 10s. $10\frac{3}{4}\ \frac{10}{17}$ ÷ 11.

XLIV.

Find the complete quotient:—

(1.) £11, 19s. $8\frac{1}{2} \div 14, 15, 16$. *Answers*, 17s. $1\frac{1}{4}\frac{4}{7}$; 15s. $11\frac{3}{4}\frac{1}{15}$; 14s. $11\frac{3}{4}\frac{1}{8}$.

(2.) £9, 11s. $5\frac{3}{4} \div 18, 21, 20$.

(3.) £8, 19s. $11\frac{1}{2} \div 22, 24, 33$.

(4.) £7, 18s. $10\frac{1}{4} \div 27, 30, 36$.

(5.) £21, 11s. $11\frac{3}{4} \div 28, 25, 32$.

(6.) £97, 9s. $5 \div 36, 40, 35$.

(7.) £81, 0s. $6\frac{1}{4} \div 44, 50, 60$.

(8.) £87, 6s. $0\frac{3}{4} \div 48, 55, 42$.

(9.) £916, 11s. $5\frac{1}{4} \div 54, 70, 66$.

(10.) £711, 11s. $11\frac{1}{2} \div 72, 84, 70$.

(11.) £918, 0s. $0\frac{3}{4} \div 63, 56, 49$.

(12.) £1196, 10s. $10\frac{1}{2} \div 64, 84, 81$.

(13.) £9876, 1s. $1\frac{1}{4} \div 88, 90, 99$.

(14.) £7641, 11s. $9\frac{3}{4} \div 96, 108, 110$.

(15.) £8742, 13s. $5 \div 120, 121, 144$.

(16.) £6831, 11s. $5\frac{3}{4} \div 132, 108, 121$.

(17.) £9763, 19s. $11\frac{1}{2} \div 100, 1000, 10000$.

(18.) £8764, 13s. $8\frac{3}{4} \div 100, 1000, 10000$.

(19.) £6382, 19s. $9\frac{1}{4} \div 200, 300, 900$.

(20.) £6311, 11s. $11\frac{1}{2} \div 1100, 12000, 90000$.

(21.) £7656, 13s. $8\frac{1}{2} \div 2500, 3600, 72000$.

(22.) £43, 19s. $8\frac{1}{2}\frac{5}{6} \div 36, 48, 50$. *Answers*, £1, 4s. $5\frac{9}{4}\frac{9}{1}\frac{9}{1}\frac{9}{6}$; 18s. $3\frac{3}{4}\frac{9}{3}\frac{9}{8}\frac{9}{8}$; 17s. $7\frac{9}{4}\frac{1}{8}\frac{6}{0}\frac{1}{0}$.

(23.) £76, 13s. $11\frac{1}{4}\frac{4}{7} \div 42, 72, 84$.

(24.) £89, 11s. $5\frac{1}{2}\frac{7}{9} \div 96, 100, 108$.

(25.) £687, 9s. $5\frac{1}{4}\frac{9}{11} \div 81, 63, 144$.

XLV.

Find the complete quotient:—

(1.) £341, 13s. $8\frac{1}{2} \div 17, 13, 19$. *Answers*, £20, 1s. $11\frac{3}{4}\frac{5}{17}$; £26, 5s. $8\frac{9}{4}\frac{9}{13}$; £17, 19s. $8\frac{9}{4}\frac{5}{19}$.

(2.) £832, 19s. $8\frac{1}{2}$ ÷ 29, 23, 31.
(3.) £645, 11s. $7\frac{1}{2}$ ÷ 37, 43, 57.
(4.) £743, 13s. $5\frac{3}{4}$ ÷ 39, 41, 53.
(5.) £18, 0s. $9\frac{1}{2}$ ÷ 47, 61, 71.
(6.) £310, 8s. $0\frac{3}{4}$ ÷ 59, 65, 83.
(7.) £100, 11s. $10\frac{1}{2}$ ÷ 67, 78, 89
(8.) £201, 1s. $1\frac{1}{4}$ ÷ 69, 73, 91.
(9.) £0, 19s. $11\frac{3}{4}$ ÷ 99, 467, 548.
(10.) £832, 14s. 11 ÷ 243, 567, 354.
(11.) £1245, 13s. $8\frac{1}{4}$ ÷ 437, 109, 504.
(12.) £7684, 19s. $11\frac{1}{2}$ ÷ 652, 679, 708.
(13.) £89, 16s. $4\frac{1}{2}$ ÷ 908, 805, 709.
(14.) £41, 11s. $0\frac{3}{4}$ ÷ 2354, 8743.
(15.) £8965, 0s. $0\frac{1}{2}$ ÷ 4783, 8743.
(16.) £81, 11s. $4\frac{1}{2}$ ÷ 7900, 8300.
(17.) £45681, 13s. $9\frac{3}{4}$ ÷ 9700, 39000.

Find the quotient and remainder :—

(18.) £1011, 1s. $1\frac{1}{4}$ ÷ 6842, 7603. *Ans.* 2s. $11\frac{1}{4}$ + £6, 2s. $8\frac{3}{4}$; 2s. $7\frac{3}{4}$ + £5, 4s. 10.
(19.) £9999, 19s. $9\frac{3}{4}$ ÷ 5682, 9876.
(20.) 8888, 18s. $8\frac{3}{4}$ ÷ 9999, 7777.

Find the complete quotient :—

(21.) £896, 11s. $4\frac{1}{2}\frac{1}{3}$ ÷ 29, 37, 43. *Ans.* £30, 18s $3\frac{3}{4}\frac{4}{37}$; £24, 4s. $7\frac{1}{2}\frac{5}{11}$; £20, 17s. $0\frac{9}{4}\frac{53}{129}$.
(22.) £87, 16s. $11\frac{1}{2}\frac{4}{5}$ ÷ 43, 53, 61.
(23.) £981, 13s. $6\frac{1}{2}\frac{5}{7}$ ÷ 79, 87, 93.
(24.) £41, 13s. $8\frac{1}{4}\frac{3}{8}$ ÷ 432, 531, 629.
(25.) £39, 18s. $0\frac{3}{4}\frac{5}{11}$ ÷ 2900, 23100.

Find the quotient and remainder :—

(26.) £891, 0s. $11\frac{9}{4}\frac{5}{13}$ ÷ 39000, 79100.

Compound Multiplication when the Multiplier contains a Fraction.

XLVI.

(1.) Find the fifth of £6, 9s. $8\frac{3}{4}$. *Ans.* £1, 5s. $11\frac{1}{4}\frac{3}{5}$.

(2.) Find the three-fifths of £18, 19s. $11\frac{1}{2}$. *Ans.* £11, 7s. $11\frac{1}{2}\frac{3}{5}$.

(3.) £27, 13s. $6\frac{1}{4} \times \frac{4}{7}$, $\frac{5}{11}$, $\frac{9}{11}$.

(4.) £39, 0s. $10\frac{3}{4} \times \frac{8}{11}$, $\frac{11}{12}$, $\frac{5}{13}$.

(5.) £50, 15s. $3\frac{3}{4} \times 9\frac{2}{3}$, $7\frac{4}{5}$.

(6.) £111, 7s. $2 \times 11\frac{3}{4}$, $12\frac{4}{7}$.

(7.) £99, 18s. $0\frac{1}{4} \times 8\frac{4}{5}$, $9\frac{6}{7}$.

(8.) £203, 1s. $3 \times 11\frac{5}{8}$, $12\frac{7}{9}$.

(9.) £584, 12s. $7\frac{1}{2} \times 10\frac{6}{7}$, $13\frac{5}{7}$.

(10.) £639, 7s. $4 \times 14\frac{5}{8}$, $24\frac{1}{12}$.

(11.) £152, 5s. $11\frac{1}{4} \times 18\frac{7}{9}$, $17\frac{5}{9}$.

(12.) £323, 16s. $8 \times 24_{\frac{7}{12}}$, $25_{\frac{9}{10}}$.

(13.) £194, 6s. $10\frac{3}{4} \times 17_{\frac{9}{11}}$, $29_{\frac{8}{11}}$.

(14.) £108, 17s. $5\frac{1}{4} \times 100\frac{4}{7}$, $111\frac{6}{7}$.

(15.) £150, 10s. $10 \times 97\frac{5}{8}$, $183_{\frac{7}{10}}$.

(16.) £123, 12s. $11\frac{1}{4} \times 205\frac{7}{9}$, $361_{\frac{8}{11}}$.

(17.) £254, 10s. $3\frac{3}{4} \times 29_{\frac{11}{12}}$, $37_{\frac{4}{15}}$.

(18.) £340, 16s. $10\frac{3}{4} \times 2001_{\frac{9}{17}}$, $3011_{\frac{17}{19}}$.

(19.) £54, 16s. $10\frac{1}{2}\frac{1}{3} \times 11\frac{5}{8}$, $19\frac{6}{7}$.

(20.) £108, 2s. $9\frac{1}{4}\frac{3}{7} \times 25\frac{8}{9}$, $311_{\frac{11}{11}}$.

XLVII.

Compound Division when the Divisor contains a Fraction.

Find the complete quotient :—

(1.) £69, 13s. $5 \div \frac{4}{5}$, $\frac{5}{6}$, $\frac{6}{7}$. *Answers*, £87, 1s. $9\frac{1}{2}$; £83, 12s. $1\frac{9}{4}\frac{4}{5}$; £81, 5s. $7\frac{3}{4}\frac{1}{5}$.

(2.) £18, 11s. $4\frac{1}{2} \div \frac{7}{10}$, $\frac{9}{11}$, $\frac{11}{12}$.

(3.) £13, 16s. $5\frac{1}{4} \div 4\frac{2}{3}$, $6\frac{5}{7}$.

(4.) £9, 11s. $11\frac{3}{4} \div 8\frac{4}{5}$, $9\frac{7}{8}$.

(5.) £19, 13s. $8 \div 10\frac{4}{5}$, $11\frac{6}{7}$.

(6.) £160, 9s. $8\frac{1}{2} \div 12\frac{6}{8}$, $11\frac{8}{9}$.

(7.) £981, 14s. $9\frac{1}{4} \div 13\frac{3}{5}$, $16\frac{4}{7}$.

Find the quotient and remainder :—

(8.) £970, 11s. $9\frac{3}{4} \div 15\frac{4}{7}$, $16\frac{8}{11}$.

Answers, £62, 6s. $7\frac{1}{2} + \frac{3}{4}$d. $\frac{6}{7}$; £59, 12s. $10\frac{3}{4} + 1\frac{1}{2}$d. $\frac{10}{11}$.

(9.) £845, 13s. $8 \div 19\frac{2}{3}$, $21\frac{4}{5}$.

(10.) £1150, 13s. $6\frac{3}{4} \div 24\frac{2}{7}$, $29\frac{4}{5}$.

(11.) £891, 11s. $4\frac{1}{2} \div 31\frac{5}{6}$, $47\frac{4}{5}$.

Find the complete quotient :—

(12.) £863, 13s. $5\frac{1}{2}\frac{2}{3} \div 19\frac{5}{6}$, $17\frac{6}{11}$.

(13.) £491, 19s. $7\frac{1}{2}\frac{4}{5} \div 21\frac{4}{7}$, $39\frac{5}{8}$.

Find the quotient and remainder :—

(14.) £691, 18s. $3\frac{3}{4}\frac{5}{7} \div 37\frac{4}{9}$, $43\frac{6}{10}$.

(15.) £8976, 14s. $5\frac{9}{4}\frac{6}{7} \div 100\frac{8}{11}$, $1000\frac{11}{12}$.

XLVIII.

VULGAR FRACTIONS—*(continued)*.

Find the value of—

(1.) $\frac{1}{6}$d. *Ans.* $\frac{3}{4}$d. $\frac{1}{6}$; $\frac{6}{7}$d.; $\frac{5}{9}$d.

(2.) $\frac{6}{7}$s.; $\frac{8}{9}$s.; $\frac{8}{11}$s.

(3.) £$\frac{6}{7}$. *Ans.* 17s. $1\frac{1}{2}\frac{6}{7}$; £$\frac{8}{11}$; £$\frac{9}{19}$.

(4.) £$2\frac{3}{7}$; £$4\frac{5}{8}$; £$6\frac{4}{11}$.

(5.) $\frac{9}{7}$ of a guinea, $\frac{4}{5}$ of half-a-guinea, $\frac{5}{7}$ of half-a-crown.

(6.) $\frac{4}{5}$ of $\frac{10}{11}$ of 15s.; $\frac{2}{3}$ of $\frac{9}{7}$ of $3\frac{1}{2}$ crowns; $\frac{4}{5}$ of $\frac{7}{8}$ of 16 half-guineas.

(7.) £$718\frac{1}{3}$ + £$99\frac{1}{2}$ + £$8976\frac{5}{12}$ + £$89\frac{1}{4}$ + £$96\frac{1}{12}$ + £614 + £$8961\frac{1}{3}$ + £$764\frac{7}{12}$ + £$89\frac{11}{12}$ + £$361\frac{5}{6}$.

(8.) £8976, $11\frac{4}{5}$s. + £89, $13\frac{5}{6}$s. + £969, $14\frac{1}{3}$s. + £7645, $19\frac{2}{3}$s. + £961, $14\frac{7}{8}$s. + £89, $11\frac{5}{6}$s. + £741, $11\frac{1}{6}$s. + £9781, $11\frac{8}{9}$s. + £4, $13\frac{2}{3}$s.

(9.) £896, $9\frac{4}{11}$s. — £764, $11\frac{4}{13}$s.

(10.) £897$\frac{3}{7}$ — £98$\frac{5}{14}$.

(11.) £72, 19s. 8$\frac{8}{9}$ + £36, 18s. 4$\frac{1}{2}$ — £36, 18s. 9$\frac{7}{8}$ — £96, 19s. 7 + £38, 17s. 6$\frac{3}{4}$.

(12.) $496\frac{4}{15}$d. — $274\frac{11}{15}$d. + $96\frac{9}{15}$d. — $147\frac{8}{15}$d. — $11\frac{8}{15}$d. + $49\frac{6}{15}$d.

(13.) £31, 14$\frac{4}{7}$s. × 503 ; £69$\frac{7}{9}$ × 603.

(14.) $\frac{2}{3}$ of $\frac{4}{5}$ of £1 × 17$\frac{1}{2}$; 1$\frac{1}{2}$ of 2$\frac{1}{4}$ of £$\frac{5}{9}$ × $\frac{3}{5}$.

(15.) $\frac{3}{5}$ of $\frac{5}{11}$ of a crown × 1$\frac{1}{4}$; $\frac{5}{7}$ of $\frac{1}{12}$ of $\frac{3}{5}$ of 1 half-guinea × 7$\frac{1}{2}$.

(16.) 19$\frac{4}{7}$ half-crowns ÷ 9$\frac{3}{5}$; 16$\frac{3}{4}$ half-guineas ÷ 11$\frac{1}{7}$.

(17.) 6$\frac{3}{5}$ of 7$\frac{1}{2}$ of £$\frac{5}{11}$ ÷ 6$\frac{1}{5}$.

(18.) $\frac{\frac{5}{7}+3\frac{1}{5}}{3\frac{5}{7}}$ of £1$\frac{1}{4}$ ÷ 11$\frac{1}{3}$.

(19.) If 4s. 5d. be $\frac{2}{3}$ of a sum of money, what is the whole sum? *Ans.* 6s. 7$\frac{1}{2}$d.

(20.) If £1, 3s. 8d. be $\frac{4}{5}$ of a sum of money, what is the whole sum?

(21.) If £3, 1s. 11$\frac{1}{2}$d. be 2$\frac{5}{7}$ of a certain sum, what is the whole sum?

(22.) If 6s. 9$\frac{3}{4}$d. be $\frac{5}{8}$ of a sum of money, what is the whole sum?

XLIX.

Reduce :—

(1.) To shillings *only*, 77 guineas, 13s. 9d. (*ans.* 1630$\frac{3}{4}$s.) ; to shillings only, £35, 14s. 8d. (*ans.* 714$\frac{3}{5}$s.) ; to sixpences only, £79, 14s. 9d. (*ans.* 3189$\frac{1}{2}$).

(2.) To half-crowns only, £38, 4s. ; to half-sovereigns only, £91, 13s. 6d. ; to pounds only, 8764386s. 8d.

(3.) To pounds only, 981417s. 6d. ; to shillings only, 764810d. ; to shillings only, 681157$\frac{1}{2}$d.

(4.) To guineas only, £976, 17s. ; to pounds only, 976 guineas, 17s. ; to half-guineas only, 989 half-crowns, 2s. 3d.

(5.) To pence only, $\frac{2}{3}$s. (*ans.* 10d.) ; $\frac{1}{3}$ crown (*ans.* 48d.) ; $\frac{1}{7}$ florin (*ans.* 20$\frac{4}{7}$d.).

(6.) To pence only, £$\frac{2}{3}$; $\frac{2}{7}$ of a guinea ; $\frac{3}{5}$ of half-a-guinea.

(7.) To shillings only, $\frac{1}{7}$ of £1 ; $\frac{3}{4}$ of 1 guinea ; $\frac{3}{4}$ of half-a-crown.

(8.) To shillings only, $\frac{1}{7}$ of £4 ; $\frac{1}{4}$ of 3 guineas ; $\frac{1}{4}$ of three half-crowns.

(9.) To threepenny-bits only, $\frac{8}{11}$ of £3 ; to farthings only, $\frac{1}{15}$ of 15s. ; to halfpence only, $1\frac{1}{3}$ of 18s. 6d.

(10.) $\frac{4}{5}$d. to the fraction of 1s. (*ans.* $\frac{1}{15}$) ; $\frac{1}{3}$d. to the fraction of 1s. (*ans.* $\frac{1}{36}$) ; $\frac{5}{6}$d. to the fraction of a crown (*ans.* $\frac{1}{72}$).

(11.) $\frac{3}{10}$d. to the fraction of a florin ; $\frac{5}{8}$s. to the fraction of £1 ; $\frac{9}{20}$s. to the fraction of £1.

(12.) $\frac{2}{3}$ of a crown to the fraction of £1 ; $\frac{5}{8}$ of a florin to the fraction of £2 ; $\frac{9}{7}$ of half-a-crown to the fraction of £3.

(13.) $\frac{2}{3}$ of 6s. to the fraction of 10s. ; $\frac{3}{5}$ of 15s. to the fraction of 18s. ; $\frac{1}{7}$ of 14s. to the fraction of £3, 4s.

(14.) Express $\frac{2}{3}$ of $\frac{4}{7}$ of £2, 2s. as the fraction of 18s. 6d. ; $\frac{3}{4}$ of $\frac{2}{5}$ of $\frac{5}{6}$ of £6, 10s. as the fraction of £10 ; $\frac{1}{4}$ of a crown as the fraction of $\frac{6}{7}$ of a guinea.

(15.) Find what fraction $\frac{3}{8}$ of $\frac{8}{9}$s. is of a crown ; $\frac{5}{6}$ of $\frac{6}{11}$ of £1 is of 1 guinea ; $\frac{6}{7}$ of $\frac{1}{12}$ of 1 half-crown is of $\frac{5}{6}$ of $\frac{6}{7}$ of 1 half-guinea.

L.

(1.) The sales in a retail shop for the first six months of the year were as follows :—£29, 18s. 4½d., £37, 11s. 6d., £31, 19s. 6¾d., £27, 13s. 6¼d., £29, 13s. 11d., £33, 14s. 2½d. Find the average sales per month.

(2.) How many sovereigns, half-sovereigns, crowns, half-crowns, florins, shillings, sixpences, and pence, are contained in £108, 17s. 5d., and of each an equal number.

(3.) Find the nearest sum of money to £35, 17s. 8d. that can be divided by 37 without a remainder.

(4.) Ten lbs. of tobacco at 4s. 6d. per lb., 11 lbs. at 5s. 3d. per lb., and 8 lbs. at 6s. 5d. per lb. are mixed together? At what price per lb. must the mixture be sold so as to gain £2, 4s. 1d. on the whole ?

(5.) A person has an income of £1010, and spends

during the first 9 months of the year on an average, £87, 16s. 9d. per month. How much may he spend on an average per month during the remaining 3 months, so as not to run into debt?

(6.) Divide £179, 9s. 5½d. among 37 persons, so that 13 of them may receive 19s. 11½d. each more than each of the others.

(7.) Divide £24, 16s. among 5 men, 9 women, and 6 boys, so that a woman may receive 3 times as much as a boy, and a man 4 times as much as a woman.

(8.) A merchant sold 90 cwt. of sugar at 33s. per cwt., and received in payment £100, and 194 lbs. of tobacco. What was the price of the tobacco per lb.?

(9.) Four Spanish reals, 3 threepenny bits, and 3 half-crowns, amount to 9s. 8d. What is the value of a real?

(10.) A merchant mixes 30 lbs. of tea at 2s. per lb., 25 lbs. at 2s. 6d. per lb., and 11 lbs. at 3s. 2d. per lb. At what price must he sell the mixture per lb. so as not to lose?

(11.) How many gallons of water must be mixed with 27 gallons of spirits at 18s. 6d. per gallon, so that the mixture may be sold at 16s. 9d. per gallon, with a profit of £2, 13s. 3d. on the transaction?

(12.) A merchant bought 20 lbs. of tobacco at 6s. 6d. per lb., which he mixed with some inferior tobacco. He sold the whole for £12, at 5s. 4d. per lb., and gained £1, 15s. on his outlay. How many lbs. were there of the inferior tobacco, and at what price per lb.?

PRACTICE.

LI

(1.) 635 articles at £1, £2, £5. *Answers*, £635, £1270, £3175.

(2.) 720 articles at 10s., 6s. 8d., 5s. *Answers*, £360, £240, £180.

(3.) 851 articles at 4s., 3s. 4d., 1s. 8d. *Answers*, £170, 4s.; £141, 16s. 8d.; £70, 18s. 4d.

(4.) 970 articles @ 2s. 6d., 2s., 6s. 8d.
(5.) 671 „ @ 6s. 8d., 4s., 3s. 4d.
(6.) 723 „ @ 5s., 2s. 6d., 1s. 8d.
(7.) 851 „ @ 2s., 3s. 4d., 6s. 8d.
(8.) 853 „ @ £1, 10s., £2, 5s., £4, 4s.
(9.) 890 „ @ £3, 4s., £5, 1s. 8d., £6, 3s. 4d.
(10.) 753 „ @ £4, 6s. 8d., £7, 3s. 4d., £9, 2s. 6d.
(11.) 537 „ @ £5, 6s. 8d., £2, 3s. 4d., £7, 2s. 6d.
(12.) 653 „ @ £11, 1s. 8d., £12, 2s., £9, 6s. 8d.

(13.) 742 yards @ 1s., 3s., 7s.
(14.) 699 „ @ 6d., 4d., 3d.
(15.) 891 „ @ 2d., 1d., 1½d.
(16.) 724 „ @ 4d., 1½d., 3d.
(17.) 721 „ @ 1s. 4d., 1s. 2d., 1s. 1½d.
(18.) 834 „ @ 2s. 4d., 3s. 6d., 5s. 2d.
(19.) 972 „ @ 7s. 1½d., 9s. 6d., 8s. 3d.
(20.) 899 „ @ ½d., 1¼d., 1½d.
(21.) 763 „ @ 10d., 7d., 5d.
(22.) 832 „ @ 3d., 3½d., 5½d.

(23.) 694 cwts. @ 15s., 13s. 4d., 12s. 6d. *Answers*, £520, 10s., £462, 13s. 4d., £433, 15s.

(24.) 891 cwts. @ 11s., 12s., 11s. 3d. *Answers*, £490, 1s. £534, 12s., £501, 3s. 9d.

(25.) 763 cwts. @ 11s. 8d., 16s. 8d., 10s. 10d. *Answers*, £445, 1s. 8d., £635, 16s. 8d., £413, 5s. 10d.

(26.) 897 cwts. @ £2, 11s., £3, 15s., £4, 12s. 6d. *Answers*, £2287, 7s., £3363, 15s., £4148, 12s. 6d.

(27.) 671 cwts. @ £3, 11s. 8d., £2, 16s. 8d., £4, 10s. 10d. *Answers*, £2404, 8s. 4d., £1901, 3s. 4d., £3047, 9s. 2d.

(28.) 842 cwts. @ £2, 12s., £3, 11s. 3d., £3, 11s. 8d.

(29.) 161 tons @ £2, 8s. 4d., £3, 8s., £4, 7s. 6d.

(30.) 321 „ @ £3, 7s. 4d., £2, 6s. 3d., £3, 6s.

(31.) 743 „ @ £3, 5s. 10d., £4, 5s. 7½d., £3, 5s. 6d.

(32.) 861 tons @ £2, 5s. 5d., £3, 4s. 2d., £2, 3s. 9d.
(33.) 723 „ @ £4, 3s. 8d., £2, 3s. 9d., £4, 3s. 1½d.
(34.) 829 „ @ £4, 3s., £3, 2s. 11d., £1, 2s. 9½d.
(35.) 721 „ @ £2, 2s. 9¾d., £3, 2s. 8½d., £1, 2s. 11d.
(36.) 645 acres @ £2, 1s. 10½d., £3, 1s. 5d., £1, 1s. 6¾d.
(37.) 742 „ @ £4, 1s. 5½d., £3, 1s. 4½d., £2, 1s. 4¼d.
(38.) 843 „ @ £1, 18s. 4d., £2, 14s. 6d., £3, 3s. 8d.
(39.) 671 „ @ £3, 2s. 11d., £4, 3s. 3d., £2, 4s. 7d.
(40.) 693 „ @ £2, 9s. 8d., £3, 8s. 2d., £4, 8s. 8d.
(41.) 425 „ @ £4, 7s. 11d., £3, 6s. 5½d., £4, 5s. 11d.
(42.) 892 „ @ £3, 1s. 6¾d., £4, 1s. 5¾d., £2, 3s. 0¾d.

The following methods are useful :—

(*Ex.* 1.) 674 at £3, 19s. 11¾d.

674 at £4 = £2696 0 0
674 at ¼d. = 0 14 0½

Therefore 674 at £3, 19s. 11¾d. = £2695 5 11½

(*Ex.* 2.) 253 at £2, 5s. 0½d.

	5s.	½	£253
			2
			£506
			63 5 0
253 at ½d. =	...	...	0 10 6½
			£569 15 6½

(43.) 841 articles at £2, 19s. 11½d., £3, 19s. 11d., £2, 19s. 10d.

(44.) 364 articles at £3, 19s., £2, 18s., £3, 16s.

(45.) 741 articles at £2, 10s. 0½d., £3, 10s. 0¼d., £2, 5s. 0¾d.

(46.) 624 articles at £3, 1s. 8½d., £4, 2s. 6¼d., £5, 3s. 4¾d.

(47.) 896 articles at £2, 2s. 0½d., £3, 3s. 4¼d, £2, 9s. 11¾d.

(48.) 974¼ acres at £2, 16s. 8d. (*Ans.* £2760, 7s. 6d.); 897½ acres at £3, 11s. 3d. (*Ans.* £3197, 6s. 10½d.).

(49.) 832½ acres at £3, 15s.; 724⅔ acres at £2, 12s. 6d.

(50.) 671⅜ acres at £2, 13s. 4d.; 893$\frac{5}{17}$ acres at £4, 16s. 3d.

(51.) 891⅛ acres at £1, 11s. 8d.; 763$\frac{8}{11}$ acres at £4, 5s. 10d.

(52.) 675⅘ acres at £3, 14s.; 893$\frac{7}{11}$ acres at £2, 3s. 9½d.

INVOICES OR BILLS OF PARCELS.

LII.

(1.) *London*, 11*th February* 1872.

Mr Andrew Robertson.

Bought of John Dickson.

1872.			£	*s.*	*d.*
Jan. 3.	5 lbs.	of beef @ 11½d.	0	4	9½
„ 7.	4 „	of mutton @ 9¾d.	0	3	3
„ 25.	6 „	of beef @ 1s. 1d.	0	6	6
Feb. 2.	3 „	of ham @ 1s. 9d.	0	5	3
„ 5.	5 „	of mutton @ 10d.	0	4	2
„ 8.	2 „	of sausages @ 1s. 2d.	0	2	4
			£1	6	3½

(2.) *Liverpool*, 4*th June* 1872.

George Dods, Esq.

To John Thomson.

1872.			£	*s.*	*d.*
April 3.	5 lbs.	of tea @ 3s. 6d.			
„	8 „	of sugar @ 4½d.			
„	3 „	of ham @ 11½d.			
May 5.	2 „	of coffee @ 1s. 8d.			
„	4 „	of sugar @ 5d.			
„	7 „	of cheese @ 9½d.			

(3.) *Edinburgh, 5th July* 1872.

Mrs Johnson.

To Alexander Heron.

1872.				£	s.	d.
May 5.	14	yards	black silk @ 13s. 6d. .			
„	8	„	ribbon @ 1s. 11½d. .			
„	11	„	calico @ 8½d. . .			
June 11.	20	„	velvet @ 27s. 9½d. .			
„	12	„	lace @ 3s. 7d. . .			
„	18	„	merino @ 7s. 2d. .			

Make out the following bills in proper form :—

(4.) *Glasgow, 13th August* 1872.—James Miller, Esq., bought of Thomas Robertson, 9 dozen sherry at 45s. ; 11 dozen port at 69s. ; 5½ dozen light ale at 3s. 6d. ; 6½ dozen porter at 4s. 6d. ; 2½ gallons whisky at 18s. 6d. ; 1¼ gallons brandy at 45s.

(5.) *Edinburgh, 18th November* 1872.—Robert Anderson, Esq., bought of Thomas A. Miller, 16 school Bibles at 1s. 2½d. ; 4 gross steel pens at 3s. 9d. ; 450 envelopes at 1s. 6d. per 100 ; 2 gross drawing-pencils at 1s. 6d. per dozen ; 3 quarts Morell's ink at 1s. 9d. ; 16 exercise books at 2d. Deduct discount at 1s. per £.

(6.) *Leeds, 17th December* 1872.—Robert Henderson, Esq., to James Wilson. 18 feet deal at 4d. ; 50 feet moulding at 3½d. ; 10 feet beech plank at 10½d. ; 25 squares of glass at 2s. 6d. ; time of 6 men, each 4 days at 4s.

(7.) *Edinburgh, 27th June* 1872.—Mr John M'Pherson, bought of Peter Scott, 27½ yards of silk at 9s. 6d. ; 25 yards calico at 10½d. ; 3 pairs of gloves at 3s. 9d. ; 18 yards muslin at 1s. 9d. ; 27 yards cotton at 10½d. ; 12½ yards ribbon at 1s. 8d.

(8.) *Liverpool, 19th August* 1872.—Mr Andrew Lamb, bought of John Stubbs, 11½ lbs. cocoa at 1s. 2d. ; 25 lbs. coffee at 1s. 5d. ; 18 lbs. tea at 3s. 4d. ; 29 lbs. candles at 9½d. ; 27 bars of soap (each 7 lbs.) at 2½d. ; 8½ dozen eggs at 1s. 4d.

(9.) *Oxford, 29th October* 187?.—Mrs Thomas Glen,

bought of John Croall, 8 lbs. beef at 1s. 2d.; 5½ lbs. mutton at 10½d.; 7 lbs. lamb at 11½d.; 3 lbs. minced meat at 1s.; 9 lbs. beef at 1s. 1d.

(10.) *London, 14th September* 1872.—Mr James Law, bought of Andrew Nelson, 25 Bibles at 14s. 6d.; 18 prayer-books (gilt morocco) at 5s. 9d.; 30 Jone's Arithmetic, Part I., at 9d. per dozen; 4 Imp. Dic. at 45s.; 16 Colenso's Arith., Part I., at 3s. 5d.; 4 gross copy books at 1s. 6d. per dozen.

(11.) *Glasgow, 13th December* 1872.—Mr John Henderson, bought of John Simpson, 5 doz. copy books at 3½d. (8th June); 6 doz. drawing pencils at 1½d. each (7th July); 18 penknives at 5½d. (11th Sept.); 9 superior ditto at 1s. 9d. (19th Sept.); 11 lbs. note paper at 1s 7d. (10th Oct.); 2 gross penholders at 4½d. per doz. (13th Oct).

(12.) *Glasgow, 3d November* 1872.—James Shaw, Esq., bought of John Stewart & Co., 4 doz. pale sherry at 45s. 6d.; 5 doz. port at 78s. 6d.; 18 doz. Dublin stout at 5s. 6d.; 20 doz. pale ale at 4s. 6d.; 8 bottles brandy at 4s. 9d.; 100 bottles soda water at 2s. 6d. per doz.

RATIO.

Terms to be explained:—*Ratio, terms, antecedent, consequent.*

LIII.

Simplify the following ratios:—

(1.) 9 : 12, 14 : 35, 19 : 38, 17 : 51.

(2.) $2\frac{1}{2} : 4\frac{1}{3}$ (*Ans.* 15 : 26), $3\frac{2}{3} : 5$, $7 : 6\frac{4}{5}$, $9\frac{4}{7} : 11\frac{5}{9}$.

(3.) 3½d. : 4¾d. (*Ans.* 14 : 19), 2s. 6d. : 3s. 4d., £1, 10s. : £2, 15s., £2, 17s. 6d. : £5.

(4.) Which of the following ratios is the greatest?—3 : 4 or 6 : 7, 9 : 10 or 11 : 12, 5 : 9 or 8 : 7, $6\frac{1}{2} : 8\frac{1}{2}$ or $9\frac{1}{3} : 10\frac{1}{3}$?

(5.) John walks at the rate of 4 miles an hour, and James at the rate of 4½. Compare their rates of walking.

(6.) The price of coffee is 1s. 6d. per lb., and of tea 3s. 6d. Compare the prices of tea and coffee.

(7.) The price of beef is 11d. per lb., and that of mutton 9d. What is the ratio of the price of beef to that of mutton, and of mutton to that of beef?

(8.) If 4 lbs. of mutton is of the same value as 6 lbs. of fish. Compare the prices of mutton and fish.

(9.) A person buys 19 yds. for 5s., and again 21 yds. for 7s. Compare the prices of the two kinds of cloth.

PROPORTION.

Terms to be explained:—*Proportion, terms, means, extremes, simple rule of three, compound rule of three, direct proportion, inverse proportion.*

LIV.

(1.) Do the numbers 3, 9, 5, and 8 constitute a proportion? If not, what must the fourth term be to form a proportion? what the third? the first? the second?

(2.) If 6 and 8 are the means, and 12 one of the extremes, what is the other?

(3.) If 9 and 12 are the extremes, and 2 one of the means, what is the other?

(4.) What number has the same ratio to 9 as 15 to 20?

(5.) What number has the same ratio to 12 as 20 to 16?

Supply the omitted terms in the following proportions:—

(6.) 8 : 12 : : 6 : ( ). *Ans.* 9.

(7.) 7 : 21 : : 9 : ( ).	(12.) 25 : 15 : : 12 : ( ).
(8.) 16 : 12 : : 8 : ( ).	(13.) 18 : 36 : : 9 : ( ).
(9.) 32 : 20 : : 28 : ( ).	(14.) 36 : 40 : : 90 : ( ).
(10.) 17 : 30 : : 19 : ( ).	(15.) 18 : 15 : : 74 : ( ).
(11.) 11 : 33 : : 19 : ( ).	(16.) 49 : 63 : : 13 : ( ).

(17.) 16 × 9 : 6 × 3 : : 7 × 8 : ( ). *Ans.* 7.

(18.) 8 × 7 : 9 × 4 : : 14 × 6 : ( ). *Ans.* 54.

(19.) 6 × 9 : 18 × 3 : : 7 × 2 : ( ).

(20.) $8 \times 3 \times 2 : 7 \times 6 \times 16 : : 2 \times 6 : (\ )$.
(21.) $4 \times 15 \times 7 : 10 \times 21 \times 3 : : 17 : (\ )$.
(22.) $8 \times 21 \times 45 : 16 \times 7 \times 9 : : 5 \times 8 \times 6 : (\ )$.
(23.) $17 \times 6 \times 3 \times 2 : 12 \times 34 \times 2 : : 3 : (\ )$.
(24.) $36 \times 7 \times 8 \times 6 : 48 \times 7 \times 16 \times 9 : : 21 : (\ )$.
(25.) $13 \times 14 \times 7 \times 3 : 7 \times 9 \times 26 \times 4 : : 49 : (\ )$.
(26.) $25 \times 16 \times 18 \times 14 : 30 \times 8 \times 36 \times 7 : : 56 : (\ )$.

(27.) $\frac{4}{5} : \frac{8}{7} : : \frac{5}{10} : (\ )$.
(28.) $\frac{3}{11} : \frac{7}{88} : : \frac{8}{7} : (\ )$.
(29.) $\frac{8}{15} : \frac{4}{5} : : \frac{16}{39} : (\ )$.
(30.) $\frac{8}{17} : \frac{24}{35} : : \frac{16}{68} : (\ )$.
(31.) $4\frac{1}{2} : 6\frac{3}{4} : : 9 : (\ )$.
(32.) $11\frac{1}{3} : 22\frac{1}{6} : : 9\frac{3}{4} : (\ )$.
(33.) $14\frac{3}{4} : 13\frac{1}{8} : : 2\frac{4}{7} : (\ )$.
(34.) $8\frac{10}{11} : 3\frac{2}{3} : : 32\frac{2}{3} : (\ )$.
(35.) $6\frac{8}{11} : 2\frac{18}{33} : : 4\frac{1}{2} : (\ )$.
(36.) $6\frac{5}{13} : 1\frac{1}{13} : : 1\frac{5}{17} : (\ )$.
(37.) $11\frac{3}{5} \times 8 : 14\frac{7}{10} \times 12 : : 9\frac{2}{7} : (\ )$. *Ans.* $17\frac{15}{28}\frac{1}{4}$.
(38.) $15\frac{5}{9} \times 8\frac{4}{5} : 10\frac{8}{9} \times 5\frac{5}{11} : : 11\frac{1}{2} : (\ )$.
(39.) $12 \times 8 \times 6\frac{5}{9} : 36 \times 8\frac{11}{18} \times 16 : : 17 : (\ )$.
(40.) $11\frac{2}{9} \times 7 \times 6 \times 1\frac{1}{2} : 10\frac{5}{18} \times 3\frac{2}{7} \times 6 \times 3 : : 14 : (\ )$.

(41.) 6 : 18 : : £4, 10s. : ( ). *Ans.* £13, 10s.
(42.) 14 : $3\frac{1}{2}$: : £5, 15s. : ( ).
(43.) $3\frac{1}{4}$: 26 : : 5s. 9d. : ( ).
(44.) $4 \times 3 \times 5 : 10 \times 9 \times 4$: : £1, 6s. 8d. : ( ).
(45.) $6 \times 9 \times 3 : 9 \times 12$: : £4, 6s. 9d. : ( ).
(46.) $7\frac{1}{2} \times 4\frac{1}{4} : 3 \times 34 \times 1\frac{1}{3}$: : £1, 3s. $11\frac{1}{2}$d. : ( ).
(47.) 4s. 2d. : 5s. 6d. : : 4 : ( ). *Ans.* $5\frac{7}{5}$.
(48.) $2\frac{3}{4}$d. : 11d. : : 17 : ( ).
(49.) 2s. $1\frac{1}{2}$d. : 3s. $4\frac{1}{2}$d. : : $5\frac{1}{2}$: ( ).
(50.) 5d. : $2\frac{1}{2}$d. : : £6, 15s. : ( ). *Ans.* £3, 7s. 6d.
(51.) 2s. 6d. : 5s. 9d. : : £2, 10s. : ( ).
(52.) 4s. $11\frac{3}{4}$d. : 3s. $2\frac{1}{2}$d. : : £4, 11s. 6d. : ( ).
(53.) 3s. 4d. $\times$ 5 $\times$ 3 : 2s. 6d. $\times$ 4 $\times$ 2 : : 7s. 6d. : ( ).
(54.) 2s. 4d. $\times$ 6 $\times$ 9 : 3s. 7d. $\times$ 5 $\times$ 4 : : £1, 10s. : ( ).
(55.) 1s. $1\frac{1}{2}$d. $\times$ 4 $\times$ $2\frac{1}{3}$: 2s. $4\frac{3}{4}$d. $\times$ $3\frac{1}{3}$ $\times$ 2 : : £2, 15s. : ( ).

RULE OF THREE.

LV.

(1.) If 5 lbs. of tea cost 15s., what will 19 lbs. cost? *Ans.* £2, 17s.

(2.) If 18 lbs. of coffee cost £1, 16s., what will 11 lbs. cost? *Ans.* £1, 2s.

(3.) If 17 ounces of silver be sold for £4, 5s., what will be the price of 31 ounces?

(4.) If a farmer buy 7 oxen for £126, what should be given for 4?

(5.) If the expense incurred by keeping 3 horses for a week be £1, what will it cost to keep 24 horses for the same time?

(6.) If I travel by coach 9 miles for 4s., what shall I have to pay if I travel 27 miles?

(7.) If 9 days' wages for one man be £1, 4s., what will be his wages for 44 days?

(8.) A person bought 9 dozen of eggs for 12s., and sold 6 dozen of them without profit. How much was paid for the 6 dozen?

(9.) A bookseller bought 39 copies of a new book and sold 17 of them for £2, 11s., what will he get for the rest if he sell them at the same rate?

(10.) If a man walk 242 miles in 11 days, how far will he walk in 17 days?

(11.) If 9 men can perform a piece of work in 35 days, in what time will 5 men do the same?

(12.) If 3000 men in a besieged city consumed a stock of provisions in 150 days, how long would the provisions have lasted if they had received at the beginning a reinforcement of 4000 men?

(13.) If 16 men can build a wall in 54 days, how many men would be required to do it in 36 days?

(14.) If the wages of 17 men for a certain time amount to £5, 2s., how many men would earn £9, 12s. in the same time?

(15.) If the expenses of a family of 9 persons be £12 a month, what will be the expenses of a family of 5 persons at the same rate?

(16.) Nine men undertake to dig a trench in 51 days; how many men could do it in 27 days?

(17.) If 11 men can build 39 yards of wall in a certain time, how many yards could 25 men build in the same time?

(18.) How many lbs. of tea at 15 lbs. for £2, 5s. are equal in value to 150 lbs. at 4 lbs. for 8s.?

(19.) John lent James 26 marbles for 12 days; for how long must James lend John 48 marbles to return the favour?

(20.) A merchant buys 200 lbs. of tea at 2s. 6d. per lb., but one box containing 25 lbs. was lost. At what price per lb. must he sell the rest to have a profit of £10 on his first outlay?

(21.) A says to B, for every 6s. you give toward defraying the expenses of our new library, I will give 2s. 6d.; B gave £3, 3s., how much will A require to give?

(22.) If, when income-tax is 5d. per £, a man's clear income is £470, what will it be when the tax is 6d. per £?

(23.) A gentleman after paying 6d. per £ of income-tax has £444, 12s. left; what was his gross income?

(24.) The poor's-rates on a rental of £450 are £6, 10s.; what is the rental, of which the rates are £715?

(25.) The rental of a parish is £45950, 10s. What sum per £ must be levied to realise £670, 2s. 2¼d.?

(26.) A bankrupt can pay 15s. 3d. in the £, and his debts amount to £3645, 10s. What are his assets?

(27.) A bankrupt's assets are £4412, 16s. 3d., and he owes £15690. What can he pay per £?

(28.) A creditor receives a dividend of 13s. 6d. per £ on a debt of £780, and again a dividend of 2s. 6d. per £ on the deficiency. What was his loss?

(29.) A person owes £3240, 15s., and his assets are £2160, 10s. What will be received on a debt of £18, 10s.?

(30.) What is the interest on £650 at 5 per cent.?

From this example deduce a general rule for the following :—

(31.) Find the interest on £250, 10s. at $3\frac{3}{4}$ % ; £780, 15s. at $4\frac{1}{2}$ % ; £89, 16s. $7\frac{3}{4}$d. at $3\frac{3}{4}$ %.

(32.) If $2\frac{3}{4}$ yards cost £$1\frac{3}{4}$, what will $4\frac{4}{7}$ yards cost ?

(33.) If £$6\frac{3}{4}$ be paid for $14\frac{1}{7}$ yards, what will be the price of $\frac{1}{14}$ of a yard ?

(34.) If $6\frac{8}{11}$ tons of coal cost £$4\frac{1}{5}$, what will be the price of $\frac{8}{11}$ of a ton ?

(35.) If £15 equal $\frac{3}{5}$ of a sailor's prize money, what will $\frac{4}{5}$ of it be ?

(36.) If $2\frac{1}{2}$ lbs. cost $3\frac{3}{4}$s., what will $5\frac{5}{8}$ lbs. cost ?

(37.) If I pay $4\frac{1}{2}$s. for travelling $3\frac{5}{7}$ miles, what must I pay for travelling $9\frac{1}{7}$ miles ?

(38.) If $9\frac{5}{8}$s. be the price of $16\frac{1}{2}$ yards, what will be the price of $\frac{1}{4}$ of $2\frac{1}{4}$ yards ?

(39.) If 27 shares in a certain speculation cost £$108\frac{3}{8}$, what is the price of $31\frac{1}{2}$ shares ?

(40.) If 28 men can do a piece of work in $\frac{4}{7}$ of a day, how many men will be required to do it in $1\frac{1}{2}$ days ?

COMPOUND RULE OF THREE.

LVI.

(1.) If it cost £75 to keep a family of 5 persons for 25 weeks, how much will it take to keep a family of 9 persons for 52 weeks ? *Ans.* £280, 16s.

(2.) If 27 men earn £150 in 5 weeks, in how many weeks will 36 men earn £200 ?

(3.) If 9 men can mow 12 acres in 2 days, how many acres will 40 men mow in 21 days ?

(4.) If a ship's crew of 10 men use 6 bags of biscuits when the bag contains 120 biscuits, each weighing 2 ounces, in 12 days, how many bags of biscuits will a crew of 15 men consume during a voyage of 60 days, when each bag contains 200 biscuits, each weighing 3 ounces ?

(5.) If 15 cwt. be carried 70 miles for 7s., what should be charged for carrying 25 cwt. 130 miles ?

(6.) A pedestrian walking 8 hours a day reaches a distance of 432 miles in 18 days. How far will he walk in 10 days, walking 9 hours a day?

(7.) If 3 loads of hay serve 4 horses for 4 weeks, how long will 7 loads serve 12 horses?

(8.) If a penny loaf weigh 8 ounces when wheat is at £1, 4s. per quarter, what should be the price of a loaf weighing 4 lbs. when wheat is at £1, 7s. per quarter?

(9.) If £500 yield £31, 5s. of interest in 15 months, what sum will yield £50 of interest in 18 months?

(10.) If a piece of cloth 18 yards long and 15 inches wide cost £1, 5s., what will be the price of a piece 30 yards long and 9 inches wide?

(11.) If 14 persons spend £245 in 3 months, how much will last 26 persons for 18 months at the same rate?

(12.) If three fires consume 2 tons of coal in 35 days, burning 10 hours a day, how much coal will be consumed by 7 fires in 50 days, burning continuously?

(13.) If the rent of a farm of 20 acres be £42, what will be the rent of one of 38 acres if 8 acres of the latter be worth 7 of the former?

(14.) If a merchant with a capital of £6000 gain £150 in 4 months, how long will he take to gain £350 with a capital of £3500?

(15.) If a family of 8 persons can live in England for 9 months on £250, for how long could they live in Germany on the same sum, the expense there being $\frac{2}{3}$ of that in England?

(16.) If 8 men working $9\frac{2}{3}$ hours a day can earn £$6\frac{4}{5}$ in $7\frac{1}{2}$ days, how much will 7 men and a boy, who can do $\frac{1}{2}$ the work of a man, earn in $5\frac{1}{3}$ days, working $8\frac{1}{3}$ hours a day?

(17.) A family, using 3 gas burners $4\frac{2}{3}$ hours daily, when gas is at 4s. 6d. per 1000 cubic feet, pay 12s. 6d. per quarter. What will a family pay per quarter, using 4 burners $3\frac{1}{2}$ hours daily, when gas is at 4s. 9d. per 1000 cubic feet?

(18.) Eight men were employed to build a wall 32 yards long, 7 feet high, and 2 feet thick, in a certain time, but

before beginning it was found necessary to build one 40 yards long, 8 feet high, and $1\frac{3}{4}$ feet thick. How many more men would be required to complete the wall in the same time?

(19.) What is the interest on £342, 18s. for 3 years at 4 %?

From this exercise deduce a general rule for the following :—

(20.) Find the interest on £918, 15s. 6d. for $2\frac{1}{2}$ years at 3 %; £817, 16s. 9d. for $3\frac{1}{4}$ years at $5\frac{1}{2}$ %; £67, 18s. 4d. for 9 months at 6 %; £819, 15s. for 230 days at 3 %.

Miscellaneous Exercises.

LVII.

(1.) Among how many persons may £1693920, 10s. $7\frac{1}{2}$d. be divided, giving to each £27, 13s. $6\frac{1}{2}$d.?

(2.) A tax of $\frac{1}{4}$d. per £ was levied on a parish, the annual rental of which is £698497. How much did this realise?

(3.) How many yards of cloth at 11s. 6d. per yard must be given for $26\frac{2}{3}$ lbs. of tea at 3s. per lb.?

(4.) A horse, cart, and harness, cost £53, 15s. The horse and cart cost £50, 5s. The cart and harness cost £16. Find the price of each?

(5.) The expenses of a pleasure party were £7, 9s. $7\frac{1}{2}$d. Five of them paid £1, 19s. $4\frac{1}{2}$d. among them. How many were in the party?

(6.) If the price of a loaf be 8d., and of beef $9\frac{1}{2}$d. per lb., how many loaves should be given for 112 lbs. of beef?

(7.) A person exchanged 18 yards of one kind of cloth at 8s. 3d. per yard, for 33 yards of another kind. What was the price of the second kind per yard?

(8.) £$\frac{4}{5}$ — $\frac{4}{5}$ of half a guinea.

(9.) Express £1, 3s. 11d. as the fraction of £1, 9s. $10\frac{3}{4}$d.

(10.) Simplify $(7\frac{5}{6} - 3\frac{2}{3} - \frac{1}{2} + 8) \times \frac{1}{3}$.

(11.) $\frac{\frac{4}{7} \text{ of } \frac{9}{16}}{1\frac{1}{8}}$, $\frac{4\frac{1}{2}+3\frac{1}{3}}{6\frac{3}{4}-\frac{1}{4}}$.

(12.) How much must be added to 327 half-guineas, 13s. $8\frac{1}{4}$d., so that $\frac{1}{671}$ of the sum may be paid in coins of the realm?

(13.) £451, 13s. 10d. ÷ 57. Give quotient and remainder.

(14.) How often is $\frac{1}{4}$d. contained in a shilling?

(15.) How often is 1d. contained in $\frac{1}{4}$ of a shilling?

(16.) Find the sum of £$\frac{3}{7}$, $\frac{5}{9}$ of a shilling, $\frac{8}{7}$ of a crown, and $\frac{4}{7}$ of a florin.

(17.) What sum of money will contain £2, 13s. $7\frac{3}{4}$d. 491 times?

(18.) If $4\frac{1}{2}$ yards cost $6\frac{3}{4}$d., what is the price of $\frac{2}{3}$ of a yard?

(19.) Divide £63, 15s. into two sums of money, one of which shall contain as many sixpences as the other contains fourpences.

(20.) If £1, 1s. $1\frac{1}{2}$d. be $\frac{5}{11}$ of a sum of money, what is $\frac{3}{4}$ of $\frac{4}{11}$ of that sum?

(21.) A bill of £23, 19s. $7\frac{3}{4}$d. was paid by an equal number of sovereigns, half-sovereigns, crowns, shillings, sixpences, threepenny-pieces, pence, halfpence, and farthings. How many were there of each?

(22.) What fraction of 16s. 8d. is $\frac{3}{4}$ of 4s. 2d.?

(23.) $\frac{6}{7}$ of £1 + $\frac{4}{9}$ of 1 crown + $\frac{3}{5}$ of 1 florin + $\frac{8}{9}$ of 1s.

(24.) Express $\frac{5}{19}$ of £6, 13s. 4d. as the fraction of $\frac{1}{21}$ of £5, 5s.

(25.) If 5s. $8\frac{1}{2}$d. be $2\frac{1}{3}$ times a certain sum of money, how much is equal to $3\frac{1}{2}$ times that sum?

(26.) Simplify $(\frac{2}{3} + \frac{4}{5}) \div (\frac{4}{7} + \frac{5}{11})$ of $(\frac{3}{22} + \frac{7}{11})$.

(27.) Find the values of $(\frac{2}{3})^3$, $(4\frac{1}{4})^2$, $(7\frac{2}{3})^3$.

(28.) $(8\frac{2}{5} \times 4\frac{1}{7})^2$, $\quad \frac{3^2 \times 2^4 \times 5^3}{5^2 \times 3 \times 2^5}$.

(29.) If $\frac{3}{7}$ of a sum of money be £24, what is $\frac{2}{5}$ of the same sum?

(30.) What fraction of 17s. 6d. must be added to 13s. 4d. to make 15s.?

(31.) Twelve workmen were employed to build a wall round a garden, and other 15 were employed to build

one round a garden of the same size. The first set work 8 hours a-day, and finish their work in 10 days; the others work 9 hours a-day. In what time will they finish their wall?

(32.) If 5 men can build a wall in $3\frac{3}{4}$ days, in how many days could 7 men and 4 boys do it, 3 boys being equal to 1 man?

(33.) Simplify $9\frac{1}{4} - (4\frac{3}{5} + \frac{7}{10}) - 4\frac{9}{10} \times \frac{5}{6}$.

(34.) $29\frac{4}{5} - (4\frac{2}{3} \times 4\frac{1}{5}) - 3\frac{7}{10}$.

(35.) If a man can do $\frac{2}{7}$ of a work in one day, in what time could he finish it?

(36.) If a man can finish a work in $5\frac{1}{2}$ days, how much of it could he do in one day?

(37.) A can do a piece of work in 6 days, and B in 8 days. What part of the work will A and B do in one day working together?

(38.) A can do a piece of work in 3 days, B in 6 days, and C in 4 days; in what time could they do it working together?

(39.) Simplify $\dfrac{4\frac{1}{4} - \frac{5}{6} \text{ of } 1\frac{2}{5}}{21\frac{3}{5} + \frac{3}{10} + 5\frac{1}{3} \text{ of } 6}$.

(40.) If a man can run a mile in $\frac{5}{7}$ of $8\frac{1}{12}$ minutes, in what time will he run $\frac{3}{8}$ of $\frac{6}{7}$ of $10\frac{1}{2}$ miles?

(41.) If $\frac{3}{8}$ of $\frac{6}{11}$ of a piece of work can be done by 12 men in a certain time, how many men will be required to do $\frac{5}{6}$ of $\frac{9}{10}$ of 8 times the amount of work in the same time?

(42.) A train consisting of 4 first-class, 6 second-class, and 7 third-class carriages travelled a distance of 67 miles. The sum paid altogether by the passengers was £151, 6s. 2d., at the rates respectively of $2\frac{1}{2}$d., $1\frac{1}{2}$d., and 1d. per mile. There were 35 third-class passengers, and 24 second-class in each carriage. How many first-class passengers were there?

(43.) Find by practice the prices of 420 yards at 16s. $9\frac{1}{2}$d. per yard.

(44.) If the rent of a farm of 30 acres be £95, what will the rent of one of 20 acres be, if 4 acres of the latter be equal in value to 5 of the former?

(45.) Simplify $(3\frac{5}{6} \div 4\frac{1}{2})$ of $(10\frac{4}{5} \div 8\frac{2}{3})$ of $1\frac{6}{13}$.

(46.) $\frac{11\frac{3}{4} - 10\frac{1}{2}}{8\frac{5}{6} - 4\frac{2}{3}} \times \frac{6\frac{1}{2} - 3\frac{5}{9}}{4\frac{3}{4} - 3\frac{1}{2}}$.

(47.) After selling $\frac{3}{4}$ of a property, a person sells $\frac{2}{3}$ of $\frac{5}{7}$ of the remainder for £3006$\frac{1}{2}$. What is the value of the whole at the same rate?

(48.) If 10 men can do a piece of work in 8 days, how many men could do a piece of work 4 times as great in $\frac{1}{3}$ of the time?

(49.) If 27 men can reap a field in 15 days, but if after working 12 days 11 of them leave, in what time will the rest finish it?

(50.) If 6 men can do as much work as 9 women, and if 15 men can finish a certain work in 20 days, in what time will 8 men and 12 women do it?

(51.) If a cwt. of apples cost £$\frac{3}{7}$, and a cwt. of pears cost £$\frac{5}{11}$, how many cwts. of apples and pears, an equal number of each, may be bought for £8$\frac{1}{7}$?

(52.) The rental of a parish is £18976, 10s. What tax per £ must be levied to realise £711, 12s. 4$\frac{1}{2}$d.?

(53.) A, B, C, and D, go on a pleasure excursion. A is to pay $\frac{1}{4}$ less than B, and C and D each $\frac{1}{7}$ more than B. The expenses amount to £3, 14s. 0$\frac{1}{4}$d. How much has each to pay?

(54.) John received $\frac{3}{5}$ of a sovereign as a present. How many parts of a new book, each costing $\frac{1}{16}$ of a sovereign, could he have purchased with his money? and how much would he have had over?

(55.) If 8 sheep and 7 lambs cost £17, 17s., or 12 sheep and 9 lambs cost £25, 7s., what is the price of a sheep and of a lamb?

(56.) Divide £5, 17s. into two sums of money, one of which shall contain as many half-guineas as the other contains half-crowns.

(57.) Find the value of 691$\frac{5}{11}$ tons at £2, 18s. 1$\frac{1}{2}$d. each.

(58.) 977$\frac{3}{11}$ at £2, 11s. 7$\frac{1}{2}$d. each.

(59.) What is the interest on £650, 10s. for 2$\frac{1}{2}$ years, at 3$\frac{1}{4}$ per cent.?

(60.) If $\frac{2}{7}$ of a lb. cost £$\frac{3}{4}$, what will $\frac{5}{6}$ of a cwt. cost?

(61.) A person owns $\frac{7}{8}$ of a building, and sells $\frac{5}{24}$ of his share for £350. What is the value of the whole building at the same rate?

(62.) What fraction must be added to the sum of $3\frac{3}{5}$, $6\frac{1}{7}$, and $4\frac{1}{3}$, to make the result an integer?

(63.) Find the average of $7\frac{1}{4}$, 3, $5\frac{1}{2}$, 0, and 1.

(64.) What number divided by $\frac{1}{7}$, the quotient multiplied by $\frac{1}{5}$, and the product divided by $\frac{1}{3}$, will give a quotient of 750?

(65.) A and B can finish a piece of work in 12 days, and A can do it alone in 20 days. In what time could B do it alone?

(66.) What is the value of $\frac{3}{5}$ of $\frac{4}{5}$ of $5\frac{1}{2}$ yards, at $\frac{5}{6}$ of $\frac{7}{8}$ of 9s. per yard?

(67.) If 1 man can do $\frac{1}{2}$ of a piece of work in $\frac{1}{4}$ of a day, how many men will be required to do $5\frac{1}{2}$ times the whole work in $2\frac{3}{4}$ days?

(68.) A cistern can be filled in 3 hours by one pipe, by another in 1 hour, and emptied by a third in 2 hours. In what time would it be filled if all were set running at once?

(69.) If 3 oranges are worth 5 apples, and 8 pears worth 10 oranges, what is the value of a pear, 15 apples being sold for 9d.?

(70.) If 5s. $2\frac{1}{2}\frac{3}{5}$ be the excess of $\frac{6}{7}$ of $\frac{14}{15}$ of a sovereign over a certain fraction of a guinea, what is that fraction?

(71.) What fraction of £7, together with $4\frac{1}{2}$ sovereigns, is equal to £6?

(72.) Compare the values of 5s. 6d., 3s. 4d., and 6s. 8d.

(73.) Compare the values of $£\frac{5}{17}$, $\frac{9}{7}$ of a crown, and $\frac{2}{3}$ of 7s. 6d.

(74.) A farmer agreed to give 8 sheep, valued at £18, for 11 pigs and 18 hens. If 5 pigs were equal in value to 3 sheep, what was the price of a hen?

(75.) A butcher sold 7 rabbits and 9 pair of chickens for £2, 6s. 6d. A single rabbit and a single chicken cost 3s. 6d. By how much did the price of a chicken exceed that of a rabbit?

(76.) Divide £235 among 20 men, 15 women, and 30 children, so that a man and a child may receive together as much as 3 women—the sum given to all the women being £45.

(77.) If 1 lb. of coffee be equal in value to 24 apples, and 40 apples be worth 60 oranges, what is the price of 1 lb. of coffee when an orange is worth $\frac{1}{2}$d.?

(78.) If 2 oxen or 5 sheep eat 8 cwt. of hay in 25 days, how much ought to be paid for a supply of hay during the month of April for 6 oxen and 10 sheep, when hay is selling at 5s. per cwt.?

(79.) If John can run in 2 hours as far as James can run in $2\frac{1}{2}$ hours, how far will John run while James runs 4 miles?

(80.) A sold a yacht to B for $\frac{1}{7}$ less than what it cost him, and B sold it again to C for £120, 11s. 3d., which was $\frac{1}{11}$ less than what it cost him. What did A pay for it?

(81.) If a person has a clear income of £180 when income tax is 6d. per £, what clear income will he have when it is 4d. per £?

(82.) If 3 men and 5 women earn £4, 19s. in 8 days, or 7 men and 6 women earn £9 in the same time, in what time will 5 men and 7 women earn £68, 17s.?

(83.) Find by practice the value of 5483 articles at £13, 11s. $4\frac{1}{4}$d. each.

(84.) If 12 men can build a wall in 10 days, but if after working $2\frac{2}{3}$ days 4 of them leave, in how many days will the rest finish it?

(85.) Divide £3, 18s. between A and B, so that $\frac{1}{3}$ of A's money shall be equal to $\frac{2}{5}$ of B's.

(86.) If $\frac{1}{3}$ of A's money be equal to $\frac{2}{7}$ of B's, what part of B's money will be equal to $\frac{2}{7}$ of A's?

(87.) A and B went to gather nuts. $\frac{1}{4}$ of the number A gathered was equal to $\frac{2}{7}$ of the number B gathered. Now A had 31 more than B. How many had B?

(88.) Find the values of :—

$$\sqrt[3]{\left\{\sqrt{(2^2+3^2+\sqrt{9})\times 7}-\sqrt[3]{1}\right\}}$$

(89.) $\dfrac{(\sqrt{9}\times\sqrt{16})-(\sqrt{4}\times\sqrt[3]{27})}{(\sqrt{9}\times\sqrt{64})-(\sqrt[3]{8}\times\sqrt{81})}$

(90.) $\dfrac{7\left[\sqrt{\left\{9\left(\frac{64-1}{3^2}+4\right)+1\right\}-3}\right]}{\frac{1}{2^2}\text{ of }(2\times10+2^3)}$

(91.) $\dfrac{3^3+2^3-\sqrt{49}}{\sqrt[3]{27}+1^3+\sqrt[3]{1}}$ of $\dfrac{\sqrt{36}+4^2-\sqrt{25}}{3^4-(3\times2^4+4^2)}$

(92.) $\dfrac{7\left\{\dfrac{3\left(\frac{14\times3-3}{17-2^2}\right)^3-1}{2^3}\right\}-1}{29-2\times3}$

(93.) $\dfrac{\sqrt{(2^3\times10+1)}}{2\times3^2+1-4^2}\div\frac{1}{3}$ of $\left\{(2\times3+5)^2-1\right\}$

COMPOUND RULES.

AVOIRDUPOIS WEIGHT.

LVIII.

Reduce—

(1.) 4 cwts. 2 qrs. 17 lbs. to lbs. ; 29 lbs. 11 oz. 13 drs. to drams. *Ans.* 521 lbs. ; 7613 drs.

(2.) 7 tons 3 cwt. 2 qrs. 15 lbs. 5 oz. 11 drs. to drams , 2 tons 2 cwts. 109 lbs. 9 drs. to drams.

(3.) 7 tons 3 cwt. 89 lbs. 11 oz. to drams ; 1 cwt. 3 qrs. 17 lbs. 11 oz. 13 drs. to drams.

(4.) 8976 oz. to cwts. ; 79611 oz. to tons. *Ans.* 5 cwt. 1 lb. ; 2 tons 4 cwts. 1 qr. 19 lbs. 11 oz.

(5.) 6984567 drs. to tons ; 8976401 drs. to tons.

(6.) 7643819 drs. to tons ; 7432109 grs. to tons.

(7.) 16 tons 19 cwts. 39 lbs. 11 oz. + 540 tons 11 cwts. 98 lbs. 15 oz. + 89 tons 9 cwts. 101 lbs. 14 oz. + 36 tons 12 cwts. 89 lbs. 8 oz. + 614 tons 8 cwts. 111 lbs. 13 oz.

(8.) 3 tons 11 cwts. 2 qrs. 16 lbs. 11 oz. 9 drs. + 1 ton 19 cwts. 3 qrs. 15 lbs. 9 oz. 11 drs. + 2 tons 1 qr. 23 lbs. 13 oz. 12 drs. + 1 ton 2 cwts. 3 qrs. 19 lbs. 15 oz. 8 drs. + 2 tons 18 cwts. 1 qr. 15 lbs. 9 oz. 7 drs. + 17 cwts. 3 qrs. 27 lbs. 11 oz. 9 drs.

(9.) 1 ton 19 cwts. 111 lbs. 15 oz. 15 drs. + 2 tons 18 cwts. 109 lbs. 13 oz 11 drs. + 3 tons 17 cwts. 98 lbs. 14 oz. 9 drs. + 1 ton 9 cwts. 89 lbs. 9 oz. 11 drs. + 1 ton 14 cwts. 101 lbs. 12 oz. 12 drs. + 2 tons 19 cwts. 75 lbs. 14 oz. 9 drs.

(10.) 11 tons 13 cwts. 2 qrs. 17 lbs. 11 oz. 9 drs. — 9 tons 18 cwts. 1 qr. 25 lbs. 8 oz. 10 drs.

(11.) 18 cwts. 2 qrs. 25 lbs. 11 oz. 8 drs. — 15 cwts. 3 qrs. 27 lbs. 9 oz. 11 drs.

(12.) 1 ton 11 cwts. 105 lbs. 15 oz. 40 grs. — 1 ton 10 cwts. 111 lbs. 11 oz. 54 grs.

(13.) 3 tons 11 cwts. 3 qrs. 27 lbs. 11 oz. 8 drs × 9.

(14.) 1 ton 2 cwts. 1 qr. 11 lbs. 13 oz. × 27.

(15.) 1 ton 2 cwts. 1 qr. 13 lbs. × 192.

(16.) 1 ton 12 cwts. 2 qrs. 13 lbs. × 971.

(17.) 3 tons 2 cwts. 111 lbs. 15 oz. ÷ 11.

(18.) 2 tons 1 cwt. 3 qrs. 24 lbs. ÷ 18.

(19.) 4 tons 1 cwt. 2 qrs. 21 lbs. 13 oz. 5 drs. ÷ 49.

(20.) 1 ton 2 cwts. 1 qr. 13 lbs. ÷ 119.

(21.) 14 tons 19 cwts. 109 lbs. 11 oz. ÷ 327. Give quotient and remainder.

(22.) 3 tons 11 cwts. 21 lbs. 14 oz. × $27\frac{4}{5}$.

(23.) 6 tons 17 cwts. 1 qr. 18 lbs. 11 oz. × $39\frac{5}{8}$.

(24.) 2 tons 13 cwts. 3 qrs. 21 lbs. 11 drs. ÷ $11\frac{4}{7}$.

(25.) 3 tons 11 cwts. 2 qrs. 23 lbs. 13 oz. ÷ $29\frac{7}{8}$. Give the quotient and remainder.

(26.) 1564 lbs. to cwts. only; 13956 drs. to lbs. only.

(27.) 11 cwts. 3 qrs. 27 lbs. 4 oz. to qrs. only; 6 tons 5 cwts. 2 qrs. 17 lbs. to cwts. only.

(28.) Reduce to their lowest terms :—

$$\frac{\text{295 tons 6 cwts. 1 qr.}}{\text{885 tons 18 cwts. 3 qrs.}}; \quad \frac{\text{3 qrs. 3 lbs. 8 oz.}}{\text{1 ton 18 cwts. 1 qr. 3 lbs. 8 oz.}}$$

(29.) Reduce 19 cwts. 1 qr. 4 lbs. to the fraction of 4 tons 16 cwts. 1 qr. 20 lbs. *Ans.* $\frac{1}{2}$.

(30.) 12 tons 2 cwts. 3 qrs. 17 lbs. to the fraction of 36 tons 8 cwts. 2 qrs. 23 lbs.

(31.) 1852 tons 16 cwts. 1 qr. to the fraction of 7411 tons 5 cwt.

(32.) Reduce $\frac{4}{11}$ ton to lbs. only; $\frac{6}{7}$ cwt. to drs. only.

(33.) Reduce $\frac{4}{5}$ of $\frac{1}{16}$ of 1 lb. to the fraction of $\frac{1}{2}$ cwt.; $\frac{3}{4}$ of $\frac{6}{7}$ of $\frac{1}{3}$ oz. to the fraction of 1 lb.

(34.) Find the value of $\frac{4}{5}$ lb (*Ans.* 7 oz. $1\frac{7}{5}$ dr.); of $\frac{5}{11}$ ton.

(35.) Find the value of $\frac{2}{3}$ of $\frac{6}{7}$ of $2\frac{1}{4}$ cwt.; of $\frac{4}{5}$ of $\frac{10}{11}$ of 1 stone.

(36.) 12 tons 5 cwts. 3 qrs. 17 lbs. 15 oz. + 27$\frac{3}{4}$ cwts. 517 lbs. 1817 oz.

(37.) 4$\frac{1}{2}$ tons + 3$\frac{5}{7}$ cwts. + 18$\frac{3}{4}$ lbs. + 18$\frac{1}{2}$ oz.

(38.) 3 tons 17 cwts. 14 lbs. 8 oz. 9 drs. 25$\frac{1}{2}$ grs. — 2 tons 19 cwts. 109 lbs. 15 oz. 11 drs. 26$\frac{1}{2}$ grs.

(39.) 916$\frac{4}{7}$ tons — 645$\frac{11}{14}$ tons. Express the result in the several denominations.

(40.) 25 cwts. 419 lbs. 314 drs. — 11 cwts. 918 lbs. 619 oz.

(41.) 6$\frac{1}{4}$ tons 5$\frac{1}{2}$ cwts. 18$\frac{3}{4}$ lbs. — 5$\frac{1}{2}$ tons 16$\frac{1}{4}$ cwts. 118$\frac{1}{2}$ oz.

(42.) 3 tons 19 cwts. 118 lbs. 16$\frac{4}{7}$ oz. × 119.

(43.) 4 tons 11$\frac{2}{3}$ cwts. × 123. Express the result in the several denominations.

Find by practice :—

(44.) 3 tons 5 cwts. @ £1, 3s. 6d. per ton. *Ans.* £3, 16s. 4$\frac{1}{2}$d.

(45.) 4 tons 4 cwts. @ £3, 17s. 8$\frac{1}{2}$d. per ton. *Ans.* £16, 6s. 4$\frac{1}{2}$d.

(46.) 8 tons 2 cwts. 2 qrs. @ £1, 7s. 6$\frac{1}{4}$d. per ton.

(47.) 11 cwts. 2 qrs. @ £1, 3s. 4d. per cwt.

(48.) 8 cwts. 16 lbs. @ 14s. 11$\frac{1}{2}$d. per cwt.

(49.) 3 cwts. 14 lbs. @ £11, 17s. 8d. per cwt.

(50.) 2 cwts. 1 qr. 14 lbs. @ £3, 8s. 4d. per cwt.

(51.) 5 cwts. 1 qr. 4 lbs. @ £4, 16s. 8d. per cwt.

(52.) 5 tons 5 cwts. 2 qrs. @ £1, 3s. 8d. per ton.

(53.) 4 cwts. 1 qr. 16 lbs. @ £7, 6s. 4d. per cwt.

(54.) 3 cwts. 20 lbs. 8 oz. @ £1, 8s. 7d. per cwt.

(55.) 1 ton 3 cwts. 1 qr. 17$\frac{1}{2}$ lbs. @ £3, 14s. per cwt.

Terms to be explained :—*Gross weight, net weight, tare (allowance for the weight of the package), tret (allowance for waste of* 1 *lb. in* 26 *lbs. or* $\frac{1}{26}$*), cloff (allowance for the turning of the scales of* 2 *lbs. in* 3 *cwts. or* $\frac{1}{168}$*).*

Find the net weight of :—

(56.) 8 barrels of sugar, each 8 cwts. 2 qrs. 11 lbs. Tare 1 qr. 11 lbs. per barrel. *Ans.* 66 cwts.

(57.) 9 casks of butter, each 3 cwts. 1 qr. 15 lbs. Tare 15 lbs. per cask.

(58.) 11 chests of tea, each 1 cwt. 2 qrs. 14 lbs. Tare 16 lbs. per cwt.

(59.) 7 bales of tobacco, each 4 cwts. 3 qrs. 16 lbs. Tare 14 lbs. per cwt.

(60.) 6 cwts. 2 qrs. 14 lbs. of tobacco. Tare 24 lbs. per cwt. Tret as usual.

(61.) 10 cwts. 3 qrs. 20 lbs. of salt. Tare 1 cwt. per ton. Tret as usual.

(62.) What is the ratio of 1 ton 5 cwts. to 2 tons 1 cwt? (*Ans.* 25 : 41); of 1 cwt. 16 lbs. to 1 cwt. 56 lbs.? of 1 lb. 8 oz. to 2 lbs. 4 oz.? of 3 lbs. 6 oz. to 2 lbs. 8 oz.?

Find the fourth term in the following proportions :—

(63.) 1 ton 3 cwt. : 16 cwts. 2 qrs. : : £5, 10s. : ( ). *Ans.* £3, 18s. $10\frac{3}{4}$d. $\frac{1}{23}$.

(64.) 7 lbs. 4 oz. : 11 lbs. 5 oz. : : £1, 15s. 4d. : ( ).

(65.) £2, 10s. : £3, 15s. : : 5 cwts. 7 lbs. : ( ).

(66.) 4s. 6d. : 5s. 9d. : : 3 lbs. 4 oz. : ( ).

(67.) 4s. 2d. × 6 : 5s. 3d. × 9 : : 5 lbs. 6 oz. : ( ).

(68.) 4 cwt. 3 qrs. × $2\frac{1}{2}$: 1 cwt. 1 qr. × $6\frac{1}{4}$: : 17s. 6d. : ( ).

(69.) Shew that there are 19 times as many farthings in £36, 10s. $3\frac{3}{4}$d. as there are ounces in 1 cwt. 3 lbs. 5 oz.

(70.) 1 lb. of bronze is coined into 48 pence. What is the weight of the copper coin required to pay a debt of £113, 17s. 9d.?

(71.) A merchant buys 4 barrels of sugar, each 3 cwts. 96 lbs., for £21, 4s. He retails it at $4\frac{1}{2}$d. per lb. What is his profit, supposing that he paid 10s. 9d. per barrel for carriage, and lost 36 lbs. of the sugar?

(72.) If 1 lb. av. of bronze be coined into 48 pence, what is the weight in drs. of a penny?

(73.) If 17 lbs. of sugar cost 7s. 1d., what is the price of 3 cwts.?

(74.) If 2 cwts. 16 lbs. cost 4s. 9d., what will 5 tons 16 cwts. cost?

(75.) If $\frac{3}{5}$ lb. cost 17s. 6d., what will $2\frac{1}{2}$ cwts. cost?

(76.) Find the cost of 14 cwts. 3 qrs. $17\frac{1}{2}$ lbs. at £17, 12s. per $2\frac{1}{2}$ cwts.

(77.) If the 4 lb. loaf cost 6d. when wheat is selling at 28s. per quarter, what should be the weight in lbs. of a loaf costing 9d. when wheat is 30s. per quarter?

(78.) If I get $3\frac{1}{2}$ tons of coals for 45s. when miners' wages are 25s. per week, how much coal should I get for 75s. when wages are 28s. per week?

(79.) If $5\frac{1}{4}$ bars of iron, each $3\frac{1}{2}$ ft. long, $\frac{1}{3}$ ft. broad, and $\frac{1}{4}$ ft. thick, weigh 275 lbs., how many lbs. will 12 bars weigh, each $2\frac{1}{3}$ ft. long, $\frac{1}{4}$ ft. broad, and $\frac{1}{6}$ ft. thick?

(80.) If 1 cwt. 110 lbs. be $\frac{5}{9}$ of the weight of a box, what is the whole weight of it?

(81.) If 2 lbs. 5 oz. 12 drs. be $\frac{3}{7}$ of the weight of a parcel, what is $\frac{5}{12}$ of the weight of it?

TROY WEIGHT.

LIX.

Reduce—

(1.) 79845 grs. to oz. *Ans.* 166 oz. 6 dwts. 21 grs.

(2.) 98765489 grs. to lbs.

(3.) 3 lbs. 8 oz. 19 dwts. 17 grs. to grs.

(4.) 5 lbs. 17 dwts. 11 grs. to grs.

(5.) 13 lbs. 11 oz. 5 dwts. + 26 lbs. 9 oz. 11 dwts. + 9 lbs. 2 oz. 19 dwts. + 29 lbs. 11 oz. 18 dwts. + 31 lbs. 9 oz. + 17 dwts.

(6.) 11 lbs. 11 oz. 17 dwts. 18 grs. — 9 lbs. 9 oz. 18 dwts. 21 grs.

(7.) 11 lbs. 9 oz. 18 dwts. 21 grs. + 9 lbs. 10 oz. 9 dwts. 11 grs. + 3 lbs. 7 dwts. 9 grs. + 11 oz. 19 dwts. 23 grs. + 8 lbs. 9 oz. 10 grs.

(8.) 1 lb. 2 oz. 3 dwts. 4 grs. — 4 oz. 5 dwts. 6 grs.

(9.) 3 lbs. 7 oz. 18 dwts. 21 grs. × 39.

(10.) 3 lbs. 11 oz. 17 dwts. × 51 $\frac{1}{4}$.

(11.) 18 lbs. 11 oz. 19 dwts. 21 grs. ÷ 79 $\frac{3}{4}$.

(12.) Reduce to their lowest terms :—

$$\frac{9 \text{ dwt. } 22 \text{ grs.}}{14 \text{ dwt. } 21 \text{ grs.}} \; ; \quad \frac{8 \text{ lbs. } 5 \text{ oz. } 15 \text{ dwts.}}{9 \text{ lbs. } 10 \text{ oz. } 14 \text{ dwts. } 4 \text{ grs.}}$$

(13.) Express as lbs. only 7984 grs.

(14.) Express $\frac{3}{8}$ oz. as the fraction of $\frac{3}{4}$ lb.

(15.) Reduce 1 lb. 4 oz. to the fraction of $2\frac{1}{2}$ lbs.

(16.) Reduce $\frac{4}{5}$ of $1\frac{1}{2}$ lbs. to the fraction of $\frac{6}{7}$ of 3 lbs.

(17.) Find the value of $\frac{4}{5}$ lb.

(18.) Find the value of $\frac{8}{9}$ lb.

(19.) Find the value of $\frac{6}{7}$ of $\frac{7}{12}$ of $3\frac{1}{3}$ lbs.

(20.) $3\frac{1}{4}$ lbs. + $9\frac{3}{4}$ oz. + $17\frac{5}{8}$ dwts. + 21 grs.

(21.) 21 lbs. 4 oz. $11\frac{7}{8}$ dwts. ÷ 37. Give quotient and remainder.

Find by practice :—

(22.) 11 oz. 10 dwts. @ 5s. $8\frac{1}{2}$d. per oz.

(23.) 1 lb. 7 oz. 15 dwts. @ £4, 15s. per lb.

(24.) 3 lbs. 2 oz. 10 dwts. @ £2, 16s. 7d. per lb.

(25.) What is the ratio of 1 oz. 4 dwts. to 18 dwts. ? of 12 dwts. 18 grs. to 12 dwts. 20 grs. ?

Find the fourth term in the following proportions :—

(26.) 7 oz. 15 dwts. : 1 lb. 5 oz. : : £3, 17s. 6d. : ( ).

(27.) 3 lbs. 4 oz. × $3\frac{1}{2}$ × 2 : 1 lb. 1 oz. × $6\frac{1}{2}$ × 3 : : £17, 10s. : ( ).

(28.) In 10000 lbs. troy, how many lbs. avoirdupois ?

(29.) The value of 1 oz. troy of sovereign gold is £3, 17s. $10\frac{1}{2}$d. How many grains does a sovereign weigh ?

(30.) Given that 1 lb. av. weighs $14\frac{7}{12}$ oz. troy, how many oz. av. are equal in weight to 1 lb. troy ?

(31.) How much pure gold is there in a gold ornament weighing 2 oz. 18 dwts. 18 carats fine ?

(32.) If 40 lbs. troy of metal be coined into 1869 sovereigns, what is the weight of a sovereign, and how many grains of pure gold does it contain?

(33.) A piece of gold at £3, 15s. 6d. per oz. is worth £230, what is the value of a piece of silver of the same weight at 55s. per lb.?

(34.) If 1 lb. of silver be sold for £2, 18s., what is the value of a cup weighing 2 lbs. 5 oz., the duty being 1s. 6d. per oz., and the workmanship £1, 1s. 6d. per lb.?

(35.) If $5\frac{1}{2}$ oz. of silver cost 27s. 6d., what will $1\frac{1}{2}$ lbs. cost?

(36.) A jeweller made 6 oz. 15 dwts. 12 grs. of gold into rings, each weighing 11 dwts. 7 grs. He sold them at £2, 15s. each. What was the price of the whole number?

(37.) If 1 lb. troy of silver and alloy be coined into 66 shillings, what is the weight of a shilling, and how many grains of pure silver does it contain if 37 parts are pure silver and 3 alloy?

LX.

APOTHECARIES WEIGHT.

(1.) 11 oz. 7 drs. 1 scr. 13 grs. — 9 oz. 3 drs. 2 scrs. 19 grs.

(2.) Reduce 11 drs. 2 scrs. 19 grs. to grains.

(3.) Reduce 896457 grs. to oz.

(4.) Reduce 4 oz. 9 drs. 1 scr. 18 grs. to grains.

(5.) 5 oz. 7 drs. 2 scrs. 18 grs. × $15\frac{5}{7}$.

(6.) 3 oz. 5 drs. 2 scrs. 17 grs. ÷ 19.

(7.) 4 oz. 6 drs. 19 grs. ÷ $24\frac{4}{5}$. Give quotient and remainder.

(8.) Express $\frac{2}{3}$ of $\frac{5}{6}$ scr. as the fraction of 1 oz.

(9.) Find the value of $\frac{4}{5}$ oz.

(10.) 3 oz. 7 drs. 2 scrs. $19\frac{1}{2}$ grs. + 1 oz. 3 drs. 1 scr. $18\frac{3}{4}$ grs. + 2 oz. 1 dr. 2 scrs. 17 grs. + 8 oz. 5 drs. 1 scr. $15\frac{3}{4}$ grs. + 1 oz. 4 drs. 2 scrs. $9\frac{1}{2}$ grs.

Find by practice :—

(11.) 3 oz. 5 drs. 1 scr. @ 1s. 1½d. per oz.

(12.) 4 oz. 6 drs. 2 scrs. @ 3s. 9d. per oz.

(13.) Reduce 4 drs. 2 scrs. 17 grs. to the fraction of 6 drs. 1 scr. 16 grs.

(14.) What is the ratio of ℥v. ℈ij. to ℥vj. ℈j. ?

(15.) Find the fourth term in the following proportion :—2 oz. 5 drs. : 3 oz. 4 drs. 1 scr. : : 5s. 6d. : ( ).

(16.) What is the difference in grains between a dram avoirdupois and a dram apothecaries ?

(17.) Into how many pills may a mass weighing 5 oz. 5 drs. 2 scrs. be divided if each pill weighs 3 scrs. 5 grs. ?

(18.) An apothecary mixes ℥ij. ℥vij. ℈ijss. of one kind of drug, ℥vj. ℥vj. ℈jss. of another, ℥ij. ℈j. gr. xix. of another, and ℥iv. ℥ij. ℈ij. gr. xv. of another. What is the weight of the mixture ?

(19.) If 5 drs. 1 scr. cost 5s. 8d., how much may be had for £1, 5s. ?

(20.) If ℥ij. ℥v. cost 4s. 5d.. what is the price of ℥vij. ℈jss. ?

LXI.

LIQUID MEASURE.

(1.) 9 gals. 3 qts. 1 pt. 2 gills + 17 gals. 1 qt. 3 gills + 21 gals. 2 qts. 1 pt. 2 gill + 13 gals. 1 pt. 3 gills + 1 gal. 1 qt. 1 pt. 2 gills.

(2.) 18 gals. 1 qt. 1 pt. 2 gills — 16 gals. 3 qts. 1 pt. 3 gills.

(3.) 3 gals. 1 qt. 2 gills × 29$\frac{3}{7}$.

(4.) 27 gals. 3 qts. 1 pt. 3 gills ÷ 19$\frac{5}{8}$.

(5.) Reduce 3 gals. 3 qts. 1 pt. 3 gills to gills.

(6.) Reduce 7645 gills to qts.

(7.) 16 gals. 3 qts. 1 pt. 3$\frac{2}{5}$ gills + 26 gals. 2 qts. 1 pt. 2$\frac{7}{10}$ gills + 119 gals. 3$\frac{11}{15}$ gills + 27 gals. 1 qt. 1 pt. 2$\frac{5}{6}$ gills.

(8.) 18 gals. 3 qts. 1$\frac{1}{6}$ pt. — 13 gals. 2 qts. 1$\frac{1}{3}$ pt.

(9.) 19 gals. 2 qts. 1$\frac{3}{5}$ pt. × 17.

(10.) 16 gals. 2 qts. 1 pt. $3\frac{2}{3}$ gills ÷ 18. Find quotient and remainder.

(11.) Find the value of $\frac{3}{8}$ of $\frac{5}{9}$ of $1\frac{1}{15}$ gals.

(12.) Reduce $6\frac{3}{7}$ gals. to pints only.

(13.) Reduce 1 qt. 1 pt. 3 gills to the fraction of 2 qts. 1 pt.

(14.) What is the ratio of 15 gals. 3 qts. to 12 gals. 3 gills?

(15.) Find the fourth term in the following proportions:—4s. 5d. : 6s. 9d. : : 3 qts. 1 pt. : ( ).

4 gals. 3 qts. × $7\frac{1}{2}$: 3 gals. × $6\frac{3}{4}$: : £4, 15s. : ( ).

Find by practice :—

(16.) 3 gals. 3 qts. 1 pt. @ 17s. 6d. per gal.

(17.) 5 gals. 3 qts. 1 pt. 2 gills @ 4d. per qt.

(18.) 16 gals. 2 qts. 1 pt. @ £1, 1s. per gal.

(19.) 4 gals. 3 qts. 1 pt. $3\frac{1}{2}$ gills @ 13s. 4d. per gal.

(20.) How long will a barrel of beer last if $3\frac{1}{2}$ pints be used daily?

(21.) A merchant bought 3 hhds. of beer for £5, 15s., and retailed it $4\frac{1}{2}$d. per qt. How much did he gain, seeing he could not sell the last 5 gals. on account of it souring?

(22.) If 6 reputed quart bottles are equal to 1 gal., how many bottles can be filled out of a firkin of beer?

(23.) If 1 gal. of distilled water weigh 10 lbs. av., how much will 1 pt. weigh?

(24.) If 18 gals. 3 qts. cost £2, 17s. 6d., what is the price of $3\frac{1}{2}$ gals.?

(25.) If $2\frac{1}{2}$ gals. cost $17\frac{1}{2}$s., what will $2\frac{1}{2}$ pts. cost?

(26.) If $3\frac{1}{4}$ qts. cost 1s. 1d., what will 15 gals. $2\frac{1}{2}$ qts. cost?

(27.) Two casks contain together 62 gals. 3 qts., and one of them contains 3 gals. 1 pt. more than the other. How much does each contain?

(28.) If a liquid weigh 20 lbs. to the gallon, what part of a gallon will weigh 1 lb.?

LXII.

DRY MEASURE.

(1.) 5 lds. 3 qrs. 4 bush. 7 gals. + 3 lds. 6 bush. 5 gals. + 4 qrs. 7 bush. 3 gals. + 9 lds. 2 qrs. 1 bush. 5 gals. + 8 lds. 1 qr. 7 gals.

(2.) 11 qrs. 3 bush. 3 pks. 1 gal. × 365.

(3.) Reduce 8967 gals. to loads.

(4.) Reduce 5 lds. 4 bush. 3 pks. to gallons.

(5.) 7 qrs. 7 bush. $7\frac{5}{6}$ gals. ÷ $25\frac{3}{5}$.

(6.) 3 lds. 4 qrs. 1 bush. $1\frac{2}{3}$ gals. — 1 ld. 4 qrs. 3 bush. 1 pk. $1\frac{5}{8}$ gals.

(7.) Reduce $7\frac{5}{8}$ loads to pks. only.

(8.) Find the value of $\frac{5}{6}$ of $\frac{8}{13}$ of $6\frac{1}{2}$ loads.

(9.) Reduce 2 qrs. 2 bush. 3 pks. to the fraction of 3 qrs. 2 bush. 1 pk.

(10.) Reduce to its lowest terms—

$$\frac{4 \text{ st. } 8 \text{ lbs.}}{6 \text{ st. } 12 \text{ lbs.}} \text{ of } \frac{1 \text{ qr. } 5 \text{ bush. } 6 \text{ gals.}}{1 \text{ qr. } 7 \text{ bush.}}$$

Find by practice :—

(11.) 11 qrs. 6 bush. @ £2, 14s. 6d. per qr.

(12.) 3 qrs. 6 bush. 4 gals. @ £3, 8s. 6d. per qr.

(13.) 5 qrs. 2 bush. $2\frac{1}{2}$ pks. @ £3, 7s. 9d. per qr.

(14.) What is the weight of 15 bush. 7 gals. if 3 pts. weigh $4\frac{1}{2}$ lbs. ?

(15.) What sum has a merchant to pay for 16 qrs. 3 bush. 4 gals. @ 2s. 6d. per gal., tret being allowed at 1 gal. per bush. ?

(16.) If 5 lds. 3 qrs. cost £6, 18s., what is the price of 4 qrs. 5 bush. ?

(17.) What is the ratio of 3 bush. 2 pks. to 6 gals. ?

(18.) Find the fourth term in the following proportions :—18s. 4d. : £1, 10s. 5d. : : 3 qrs. 4 bush. 1 gal. : ( ). 3 qrs. 5 bush. : 5 qrs. 4 bush. : : £3, 14s. 6d. : ( ).

(19.) If 3 pks. 1 gal. cost 5s. 6d., how much may be had for £2, 17s. 6d.?

(20.) If $\frac{7}{9}$ of a quantity of fruit be 3 bush. 4 gals., what is the whole quantity?

LXIII.

APOTHECARIES FLUID MEASURE.

(1.) Reduce 76895 minims to gals.

(2.) Reduce 3 gals. 5 pts. 19 oz. 7 drs. 49 m. to minims.

(3.) 1 gal. 5 pts. 18 oz. 3 drs. 40 m. + 2 gals. 19 oz. 7 drs. 39 m. + 7 pts. 11 oz. 3 drs. 56 m. + 3 gals. 9 oz. 6 drs. 45 m. + 6 gals. 4 pts. 7 drs. 38 m.

(4.) 16 pts. 17 oz. 7 drs. 40 m. — 11 pts. 19 oz. 5 drs. 51 m.

(5.) Ciij. Ovj. ℥xix. ℥v. mxxx. ÷ $14\frac{1}{2}$.

(6.) Reduce $\frac{3}{4}$ of $\frac{8}{9}$ gal. to minims only.

(7.) Reduce $\frac{1}{4}$ oz. to the fraction of $\frac{5}{7}$ gal.

(8.) Find the value of $\frac{3}{7}$ gal.

(9.) Ovij. ℥xvj. ℥ivss. × 17.

(10.) What is the ratio of Ovj. ℥xviij. to Cij. Ov.

Find by practice :—

(11.) 2 pts. 15 oz. @ 2s. 9d. per pt.

(12.) 2 gals. 6 pts. 5 oz. @ £3, 16s. 8d. per gal.

(13.) If $2\frac{3}{8}$ drs. cost. $2\frac{3}{4}$d., what quantity may be got for 5s. 8d.?

LXIV.

LINEAL MEASURE.

Reduce and express in miles, yds., &c. :—

(1.) 9876 feet to miles ; 89765 in. to miles.

Reduce and express in the several denominations :—

(2.) 9678 yds. to poles (*Ans.* 1759 po. 3 yds. 1 ft. 6 in.) ; 8679 yds. to poles.

(3.) 98765 in. to miles ; 67110 in. to miles.

(4.) Reduce 5 m. 896 yds. 2 ft. 11 in. to inches ; 2 lea. 1 m. 1340 yds. 1 ft. 5 in. to inches.

(5.) Reduce 2 m. 5 fur. 20 po. 4 yds. to inches ; 3 m. 2 fur. 39 po. 3 yds. 1 ft. 11 in. to inches.

(6.) 2 m. 6 fur. 30 po. 4 yds. 2 ft. 11 in. + 11 m. 5 fur. 25 po. 5 yds. 1 ft. 3 in + 9 m. 4 fur 11 po. 3 yds. 1 ft. 9 in. + 7 m. 7 fur. 19 po. 4 yds. 2 ft. 7 in. + 1 m. 8 po. 3 yds. 11 in.

(7.) 2 m. 3 fur. 34 po. 4 yds. 1 ft. 9 in. — 1 m. 5 fur. 39 po. 5 yds. 2 ft. 10 in.

(8.) 5 fur. 35 po. 3 yds. 1 ft. 11 in. × 235.

(9.) 1 m. 5 fur. 39 po. 5 yds. 1 ft. 3 in. ÷ 45.

(10.) 16 m. 4 fur. 21 po. 4 yds. ÷ 439. Give quotient and remainder.

(11.) 36 m. 4 fur. 31 po. 2 yds. ÷ $17\frac{5}{8}$.

(12.) Reduce 8967 links to chains ; 9743 links to chains.

(13.) Reduce 49 chains to links ; 67 chains 19 lks. to links.

(14.) Reduce 14 ch. to yds. ; 1970 yds. to ch.

(15.) Reduce 1 m. 3 fur. to ch. ; 1360 ch. to miles.

(16.) 13 ch. 14 lks. × $18\frac{4}{5}$; 15 ch. 39 lks. ÷ $14\frac{3}{5}$.

Express as feet and inches :—

(17.) 7 ft. 9′ 7″ ; 6 ft. 8′ 11″.

(18.) 2 ft. 3′ 6″ 7‴ ; 8 ft. 3′ 7″ 6‴.

Express as feet, primes, seconds, &c. :—

(19.) 3 ft. $2\frac{3}{4}$ in. ; 5 ft. $4\frac{5}{6}$ in.

(20.) 4 ft. $7\frac{4}{5}$ in. ; 6 ft. $8\frac{3}{8}$ in.

(21.) Find how often 15 yds. 1 ft. 8 in. is contained in 56 yds. 2 ft.

(22.) Find how often 5 po. $4\frac{1}{2}$ yds. 9 in. is contained in 29 po. $1\frac{1}{2}$ yds. 9 in.

(23.) Reduce to their lowest terms :—

$$\frac{13 \text{ m. } 2 \text{ fur. } 4 \text{ yds.}}{53 \text{ m. } 2 \text{ po. } 5 \text{ yds.}} ; \quad \frac{5 \text{ fur. } 9 \text{ po. } 2 \text{ yds. } 1 \text{ ft. } 6 \text{ in.}}{7 \text{ fur. } 34 \text{ po. } 1 \text{ yd.}}$$

(24.) Find the value of $\frac{3}{7}$ yds. ; $\frac{5}{8}$ po.

(25.) Reduce 2 yds. $1\frac{1}{2}$ ft. to the fraction of 9 yds. 2 ft.

(26.) What fraction of 5 yds. 2 ft. is 7 ft. 9 in.?

(27.) $6\frac{4}{5}$ m. + $7\frac{3}{10}$ fur. + $3\frac{3}{4}$ po. + $18\frac{11}{12}$ yds.

(28.) 16 m. 5 fur. $3\frac{5}{8}$ po. — 13 m. 6 fur. $4\frac{3}{8}$ po., and express in the several denominations.

(29.) 2 m. 3 fur. 20 po. 4 yds. 2 ft. $5\frac{1}{2}$ in. × $39\frac{3}{4}$.

(30.) 11 ch. $50\frac{4}{5}$ lks. × 36 ; 18 ch. $40\frac{4}{5}$ lks. ÷ 19.

(31.) If 2 ft. 9 in. be $\frac{5}{6}$ of the length of a rod, what is its whole length?

(32.) If 5 yds. 1 ft. be $\frac{4}{7}$ of the length of a room, what is its breadth which is $\frac{3}{5}$ of its length?

Find by practice :—

(33.) 3 yds 1 ft. 9 in. @ £1, 4s. per yd.

(34.) 5 yds. 1 ft. 4 in. @ £2, 10s. 6d. per yd.

(35.) 7 yds. 1 ft. 6 in. @ 1s. $4\frac{1}{2}$d. per yd.

(36.) 3 yds. 2 ft. 9 in. @ 1s. $11\frac{1}{2}$d. per foot.

(37.) 5 yds. 1 ft. 9 in. @ 4s. 11d. per yd.

(38.) 6 yds. 1 ft. $4\frac{1}{2}$ in. @ 9s. 5d. per yd.

(39.) The circumference of a circle is equal to about $3\frac{1}{7}$ times the length of its diameter. If a circular croquet green measure 33 yds. round, how far must a ball roll to go from the centre to the extremity of the green?

(40.) The minute hand of a clock is $3\frac{1}{2}$ ft. long. How far will the point of it travel during one day?

(41.) A gentleman's walking-stick is 33 inches long, and at a certain time in the day casts a shadow 36 inches in length. How high must a tower be which at the same time casts a shadow 45 feet in length?

(42.) The four sides of a field measure respectively 16 ch. 39 lks., 25 ch. 42 lks., 19 ch. 51 lks., and 36 ch. 68 lks. How many yards must a man step in walking round it?

(43.) A farmer, in walking round his farm, found that he took 3531 steps. How many chains did it measure round, reckoning each step as a yard?

(44.) Shew that there are eleven times as many inches in 15 m. 4 fur. 26 po. 5 yds. 7 in. as there are ounces in 2 tons. 10 cwts. 10 lbs. 5 oz.

(45.) How many inches is a horse $16\frac{1}{4}$ hands high taller than a pony $12\frac{1}{2}$ hands high?

(46.) How many cabbage plants may be planted in a row, if the breadth of the garden be 13 yds. 1 ft., and a space of $2\frac{1}{2}$ feet be left between every two, and at either end?

(47.) If 6 yds. 2 ft. 11 in. cost 5s. $11\frac{3}{4}$d., how much may be had for £5, 11s. $9\frac{3}{4}$d.?

(48.) If 7 yds. $2\frac{1}{2}$ ft. cost 6s. $9\frac{1}{2}$d., what is the price of 9 yds. $1\frac{1}{4}$ ft.?

(49.) If 20 men can dig a trench 25 yds. long and 2 yds. wide in 28 days, working 9 hours a day, how long a trench 3 yds. wide will 50 men dig in 40 days, working 7 hours a day?

(50.) If I travel $15\frac{3}{4}$ miles for £$\frac{1}{8}$, how far may I travel for £$\frac{1}{5}$?

(51.) How far must a carriage be driven so that the fore wheel may make 100 revolutions more than the hind wheel, the diameters being $1\frac{3}{4}$ feet and $2\frac{1}{4}$ feet? (See Ex. 39.)

CLOTH MEASURE.

(52.) Reduce 3 yds. 2 qrs. 3 nls. 1 in. to inches.

(53.) Reduce 8976 in. to yds.; 96 ells to yds.

(54.) Reduce $\frac{2}{5}$ yd. to inches.

(55.) Find the value of $\frac{3}{7}$ ell.

(56.) 3 yds. 3 qrs. 1 nl. $2\frac{1}{8}$ in. — 2 yds. 3 qrs. 2 nls. $1\frac{1}{4}$ in.

(57.) 5 yds. 1 qr. 2 nls. $1\frac{1}{2}$ in. × 361.

(58) 3 yds. 1 qr. 2 nls. $2\frac{1}{8}$ in. ÷ 17. Give quotient and remainder.

Find by practice :—

(59.) 3 yds. 3 qrs. @ 17s. $6\frac{1}{2}$d. per yard.

(60.) 2 yds. 1 qr. 3 nls. @ 5s. 8d. per yard.

(61.) If 12 pieces of cloth cost £58, 14s. 6d. at the rate of 3s. $7\frac{1}{2}$d. per English ell, how many yards did each piece contain?

(62.) If it take $4\frac{1}{4}$ yds. to make a coat, and the cost of making be 16s., $2\frac{1}{2}$ yds. for trousers, and the cost of making be 8s. 9d., $\frac{3}{4}$ yd. for a vest, and the cost of making be 7s. 6d., what is the price of a suit @ 5s. 6d. per yd. Also what number of suits could be made out of 76 yds., and what length of cloth would be left over.

LXV.

SQUARE MEASURE.

Reduce—

(1.) 63 ac. 1 ro. 20 po. 20 sq. yds. to sq. yds.

(2.) 123 ac. 12 po. 21 sq. yds. to sq. yds.

(3.) 39 sq. yds. 7 sq. ft. 101 sq. in. to sq. inches.

(4.) 1 ac. 2 ro. 4 po. 19 sq. yds. 7 sq. ft. to sq. ft.

(5.) 3 ac. 3 ro. 20 po. 21 sq. yds. 5 sq. ft. 111 sq. in. to sq. in.

(6.) 712346 sq. in. to sq. yds.; 416764 sq. in. to sq. yds.

(7.) 61927616 sq. yds. to acres. *Ans.* 12794 ac. 3 ro. 33 po. 27 sq. yds. 6 sq. ft. 108 sq. in.

(8.) 40916184 sq. yds. to acres; 62317687 sq. ft. to acres.

(9.) 976811045 sq. in. to acres; 16 sq. ch. to sq. yds.

(10.) 9 ac. 3 ro. 30 po. to sq. chains; 17 sq. ch. to acres, &c.

(11.) 3 ac. 1 ro. 25 po. 30 sq. yds. + 7 ac. 3 ro. 30 po. 25 sq. yds. + 13 ac. 2 ro. 9 po. 15 sq. yds. + 6 ac. 3 ro. 25 sq. yds. + 8 ac. 2 ro. 35 po. 11 sq. yds. + 6 ac. 3 ro. 31 po. 9 sq. yds.

(12.) 7 ac. 2 ro. 9 po. 25 sq. yds. 7 sq. ft. — 6 ac. 3 ro. 7 po. 30 sq. yds. 8 sq. ft.

(13.) 5 ac. 2 ro. 16 po. 17 sq. yds. × 21.

(14.) 16 po. 25 sq. yds. 8 sq. ft. 130 sq. in. × 59.

(15.) 36 ac. 3 ro. 25 po. 27 sq. yds. 8 sq. ft. ÷ 27.

(16.) 29 ac. 2 ro. 30 po. 26 sq. yds. 7 sq. ft. 120 sq. in. ÷ 231. Give quotient and remainder.

(17.) 16 ac. + 5 ro. + 630 po. + 840 sq. yds.

(18.) 3 yds. 1 ft. × 2 yds. 2 ft. *Ans.* 8 sq. yds. 8 sq. ft.

(19.) 6 yds. 2 ft. × 4 yds. 1 ft. *Ans.* 28 sq. yds. 8 sq. ft.

(20.) 5 ft. 4 in. × 6 ft. 3 in.; 8 ft. 6 in. × 11 ft. 4 in.

(21.) 11 yds. 1 ft. × 10 yds. 11 in.; 10 ft. 5 in. × 9 ft.

Express as square feet and square inches only:—

(22.) 6 sq. ft. 3′ 7″. *Ans.* 6 sq. ft. 43 sq. in.

(23.) 5 sq. ft. 4′ 6″. *Ans.* 5 sq. ft. 54 sq. in.

(24.) 9 sq. ft. 7′ 11″; 3 sq. ft. 3′ 4″ 5‴.

(25.) 7 sq. ft. 2′ 5″ 6‴; 4 sq. ft. 3′ 4″ 7‴ 5⁗.

Express as square feet, primes, seconds, &c.:—

(26.) 8 sq. ft. 140 sq. in. *Ans.* 8 sq. ft. 11′ 8″.

(27.) 8 sq ft. 52 sq. in. *Ans.* 8 sq. ft. 4′ 4″.

(28.) 4 sq. ft. 28½ sq. in.; 5 sq. ft. 85¾ sq. in.

(29.) 4 sq. ft. 73⅝ sq. in.; 5 sq. ft. 99⅛ sq. in.

(30.) 3 ft. 2′ 3″ × 4 ft. 3′ 4″.

3 sq. ft.		2′	3″	
4	„	3′	4″	
12		9	0	
		9	6	9
		1	0	9
13 sq. ft.		7′	7″	6‴.

(31.) 2 ft. 5′ 4″ × 2 ft. 4′ 5″. *Ans.* 5 sq. ft. 9′ 5″ 6‴ 8⁗.

(32.) 6 ft. 4′ × 3 ft. 5′ 6″; 4 ft. 5′ 6″ × 2 ft. 4′.

(33.) 5 ft. 2′ 3″ × 4 ft. 0′ 5″; 2 ft. 3′ 4″ 5‴ × 1 ft. 3′ 0″ 5‴.

(34.) Reduce $35\frac{1}{2}$ sq. chains to acres, &c.

(35.) $\frac{3}{5}$ ac. to sq. yds. only; $\frac{5}{9}$ sq. ch. to sq. ft. only.

(36.) Find the value of $\frac{3}{4}$ po.; $\frac{6}{7}$ po.

(37.) Reduce 1 po. 14 sq. yds. 1 sq. ft. 108 sq. in. to the fraction of 1 po. 15 sq. yds. 8 sq. ft. 108 sq. in.

(38.) What fraction of $\frac{5}{6}$ sq. yd. is $\frac{3}{8}$ sq. ft.?

(39.) How often is 21 po. 12 sq. yds. 6 sq. ft. 108 sq. in. contained in 1 ro. 13 po. 16 sq. yds. 6 sq. ft. 108 sq. in.?

(40.) 16 sq. ml. 500 ac. 2 ro. 29 po. $17\frac{1}{2}$ sq. yds. — 11 sq. ml. 630 ac. 1 ro. 30 po. $16\frac{3}{4}$ sq. yds.

(41.) 16 sq. ml. 130 ac. 3 ro. $16\frac{3}{4}$ po. × $36\frac{5}{8}$. Give the answer in the several denominations.

(42.) 36 ac. 1 ro. 39 po. $29\frac{3}{5}$ sq. yds. ÷ $17\frac{3}{5}$. Give the answer in the several denominations.

(43.) What is the ratio of 5 sq. yds. 7 sq. ft. to 4 sq. yds. 8 sq. ft.

Find by practice:—

(44.) 7 ac. 32 po. @ £21, 14s. 7d. per acre.

(45.) 11 ac. 20 po. @ £3, 7s. 6d. per acre.

(46.) 3 sq. yds. 2 sq. ft. 36 sq. in. @ 4s. $2\frac{3}{4}$d. per sq. yd.

(47.) 11 sq. yds. 4 sq. ft. 72 sq. in. @ 1s. $11\frac{1}{2}$d. per sq. yd.

(48.) A room measures 10 ft. 3 in. in breadth, and 12 ft. 4 in. in length. What is the area of the floor?

(49.) A wall is 15 ft. 4 in. long, and 11 ft. 6 in. high. How many square yards of paper will be required to cover it?

(50.) What is the difference between 12 sq. ft. and 12 ft. square? between $8\frac{1}{4}$ sq. ft. and $8\frac{1}{4}$ feet square?

(51.) What is the area of a square building whose side measures 80 ft. 6 in.?

(52.) A sheep is tethered by a rope 7 ft. long. How many square yds. are there in the area in which it is allowed to graze? The area of a circle is equal to $3\frac{1}{7}$ times the square of its radius.

(53.) How many square feet of glass are there in a window consisting of 12 panes, each 11 in. long, and 9 in. broad?

(54.) How many square yards of painting are there in the walls and roof of a room 12 ft. long, 10 ft. broad, and 11 ft. high, allowing for a door 7 ft. high, and 3 ft. 6 in. broad, and for a window 6 ft. 2 in. by 4 ft. ?

(55.) The area of a room is 14 sq. yds., $3\frac{1}{2}$ sq. ft., and its breadth is $10\frac{1}{2}$ ft., what is its length ?

(56.) The area of a garden is $\frac{1}{2}$ acre, and its length is 60 yds., what is the length of the footpath across it ?

(57.) What length of carpet 2 ft. 8 in. broad will be required to cover a room 16 ft. broad, and 25 ft. 9 in. long ? and what will it cost at 6s. 6d. per yd. ?

(58.) What will be the expense of carpeting a room 18 ft. 4 in. long, and 14 ft. 3 in. broad, with carpet 3 ft. 8 in. broad, @ 8s. 8d. per yd. ?

(59.) How many sq. chains are there in a piece of ground measuring 9 ch. 15 lks. by 8 ch. 10 lks. ?

(60.) If the length of a piece of ground be 10 ch. 50 lks., what is the breadth of it, if its area be the same as in the last example ?

(61.) How many acres are there in a green measuring 5 ch. by 9 ch. 10 lks. ?

Flooring, roofing, &c., are charged at so much per square of 100 sq. ft. A roof is said to be of the true pitch when the rafters are in length equal to $\frac{3}{4}$ of the breadth of the building. The measure of a roof therefore is equal to $1\frac{1}{2}$ times the area of the building.

(62.) What is the expense of flooring a hall 16 yds. 2 ft. long and 7 yds. 2 feet broad, @ £5, 5s. per square ?

(63.) What is the expense of slating the roof (true pitch) of a house 80 ft. long and 30 ft. 6 in. broad, @ £1, 5s. per square ?

Brick work is charged by the rod of 272 sq. ft., and quarter rod of 68 sq. ft. Standard measure is $1\frac{1}{2}$ bricks thick. To find the standard measure, multiply by the number of half bricks thick, and divide by 3.

(64.) Reduce 1750 sq. ft. of brick work $2\frac{1}{2}$ bricks thick to standard measure.

(65.) How many rods of brick work are there in a wall 14 yds. 6 in. long and 6 ft. high, 2 bricks thick ?

(66.) What will be the expense of building a wall 1800 ft. long and 10 ft. high, $2\frac{1}{2}$ bricks thick, @ £2, 11s. per rod, standard measure?

(67.) Four pieces of ground contain in all 52 ac. 2 ro. 15 po. The 2d is twice the size of the first, the 3d three times the size of the second, and the 4th four times the size of the third. What is the size of each?

(68.) If 7 men reap 12 acres in 10 days of 9 hours each, how many acres will 6 men reap in 12 days of 10 hours each?

(69.) Divide 3 fields containing respectively 15 ac. 2 ro. 15 po., 13 ac. 1 ro. 14 po., and 16 ac. 1 ro. 7 po. among A, B, and C, so that A's number of acres may be equal to B's number of roods, and B's number of roods to C's number of poles.

(70.) A bought $\frac{3}{4}$ of a farm of 240 acres. He sold $\frac{2}{3}$ of his purchase to B, who sold $\frac{1}{6}$ of his to C. What did C pay for it at £25 per acre.

CUBIC MEASURE.

LXVI.

(1.) Reduce 197645 cu. in. to cu. yds.; 9834591 cu. in. to cu. yds.

(2.) 9 cu. yds. 11 cu. ft. 1100 cu. in. to cu. inches; 35 cu. yds. 1345 cu. in. to cu. inches.

(3.) 9 cu. yds. 20 cu. ft. 1150 cu. in. + 18 cu. yds. 25 cu. ft. 1649 cu. in. + 27 cu. yds. 13 cu. ft. 895 cu. in. + 6 cu. yds. 9 cu. ft. 85 cu. in. + 17 cu. yds. 11 cu. ft. 1236 cu. in. + 31 cu. yds. 14 cu. ft. 1369 cu. in.

(4.) 161 cu. yds. 25 cu. ft. 1149 cu. in. — 150 cu. yds. 26 cu. ft. 1350 cu. in.

(5.) 11 cu. yds. 21 cu. ft. 980 cu. in. × 36.

(6.) 25 cu. yds. 18 cu. ft. 741 cu. in. × 591.

(7.) 14 cu. yds. 23 cu. ft. 840 cu. in. × $29\frac{3}{5}$.

(8.) 150 cu. yds. 21 cu. ft. 1361 cu. in. ÷ 25.

(9.) 720 cu. yds. 19 cu. ft. 1119 cu. in. ÷ 361. Find quotient and remainder.

(10.) 14 cu. yds. 26 cu. ft. 961 cu. in. ÷ $18\frac{3}{5}$. Find quotient and remainder.

(11.) Reduce 13 cu. yds. 24 cu. ft. 1296 cu. in. to cu. yds. only.

(12.) Reduce to its lowest terms :—

$$\frac{\text{25 cu. ft.}}{\text{12 cu. yds. 9 cu. ft. 576 cu. in.}}$$

(13.) Reduce 531 cu. yds. 23 cu. ft. to the fraction of 797 cu. yds. 21 cu. ft.

(14.) Reduce $\frac{4}{5}$ cu. yds. to cu. in. only.

(15.) Reduce $\frac{1}{144}$ cu. in. to the fraction of 1 cu. ft.

(16.) $5\frac{1}{2}$ cu. yds. + $19\frac{1}{3}$ cu. ft. + $1150\frac{1}{2}$ cu. in. + $19\frac{3}{4}$ cu. yds.

(17.) 11 cu. yds. 18 cu. ft. $116\frac{5}{8}$ cu. in. × $31\frac{1}{3}$.

(18.) If $\frac{4}{5}$ of the cubical contents of a certain space be 17 cu. yds., what is the whole contents ?

Find by practice :—

(19.) 5 cu. yds. 4 cu. ft. 576 cu. in. @ 3s. 3d. per cu. ft.

(20.) 5 cu. yds. 4 cu. ft. 864 cu. in. @ £5, 17s. 6d. per cu. yd.

(21.) 10 cu. yds. 5 cu. ft. 432 cu. in. @ £11, 14s. 9d. per cu. yd.

Express as cubic feet and cubic inches only :—

(22.) 3 cu. ft. 2′ ; 5 cu. ft. 5′ ; 4 cu. ft. 4′ 5″.

(23.) 7 cu. ft. 5′ 4″ ; 4 cu. ft. 3′ 5″ 4‴ ; 6 cu. ft. 4 6″ 7‴ 5ʳᵛ.

Express as cubic feet, primes, seconds, &c. :—

(24.) 16 cu. ft. 456 cu. in. ; 4 cu. ft. 976 cu. in.

(25.) 5 cu. ft. 1170 cu. in. ; 6 cu. ft. $971\frac{1}{2}$ cu. in.

(26.) 5 cu. ft. $497\frac{3}{4}$ cu. in. ; 18 cu. ft. $561\frac{1}{8}$ cu. in.

(27.) 4 ft. 3′ × 5 ft. 2′ × 6 ft. 4′.

(28.) 2 ft. 3′ 4″ × 2 ft. 4′ 5″ × 1 ft. 6′ 4″.

(29.) 4 ft. 0′ 5″ × 6 ft. 4′ 4″ × 3 ft. 5′ 2″.

(30.) 6 ft. 3′ 4″ × 2 ft. 0′ 5″ × 2 ft. 4′.

(31.) 5 ft. 4′ 5″ × 6 ft. 2′ 4″ × 3 ft. 1′ 5″.

(32.) 4 ft. 0′ 6″ × 4 ft. 0′ 5″ × 8 ft. 2′.

(33.) 2 yds. 2 ft. × 1 yd. 1 ft. × 5 yds. 2 ft.

(34.) 1 ft. 4 in. × 2 ft. 3 in. × 1 ft. 6 in.

(35.) 1 yd. 1 ft. × 1 ft. 1 in. × 1 yd. 1 ft. 1 in.

(36.) 2 yds. 1 ft. 3 in. × 1 yd. 2 ft. 3 in. × 3 yds. 2 ft. 1 in.

(37.) 7 yds. 2 ft. 4 in. × 3 yds. 2 ft. × 1 ft. 9 in.

(38.) 6 yds. 11 in. × 3 yds. 2 ft. × 2 ft. 9 in.

(39.) A block of granite is 6 ft. long, 4 ft. broad, and 2 feet thick. How many cubic feet does it contain?

(40.) How many cubic yards of timber are there in a log 15 ft. 6 in. long, 2 ft. broad, and 1 ft. 9 in. thick?

(41.) How many cubic yards of air are there in a room 30 ft. long, 20 ft. broad, and 16 ft. 3 in. high?

(42.) A cistern is 2 ft. in length, breadth, and depth in the interior. How many gallons of water will it contain if 1 cu. ft of water weigh 1000 ounces av., and 10 lbs. equal 1 gallon?

(43.) The bottom of a box is 4 ft. square, what must be the depth of it to contain 16 cubic feet?

(44.) A cistern is 3½ feet deep, and the bottom of it is 5 feet long and 3 feet broad. What weight of water will it contain if 1 cubic foot of water weigh 1000 ounces av.?

(45.) How many inch cubes could be cut out of a deal board 2 inches thick, 3 ft. long, and 1 ft. broad?

(46.) If 36 cu. ft. of water weigh 1 ton, what weight of water would be required to fill a canal 3 miles long, 30 yds. broad, and 6 ft. deep?

(47.) A piece of timber 8 ft. 9 in. long, 4 ft. 3 in. broad, contains 96 cu. ft. 1188 cu. in. What is its thickness?

(48.) What length must be cut from a piece of timber 18 ft. long, 1 ft. 6 in. broad, and 11 in. thick, so that the remainder may contain 11 cu. ft.?

ANGULAR MEASURE.

LXVII.

(1.) Reduce 97645″ to degrees; 45° 16′ 45″ to seconds.

The difference between an angle and a right angle is called its complement, and the difference between an angle and two right angles is called its supplement.

(2.) Find the complement of 37° 45′; 29° 36′ 43″.

(3.) Find the supplement of 135° 17′ 43″; 21° 42′ 39″.

(4.) Find the value of $\frac{4}{5}$ right angle; $\frac{7}{8}$ right angle.

(5.) Find the value of $\frac{5}{6}$ of 4 right angles; $\frac{6}{11}$ of 4 right angles.

TIME.

LXVIII.

(1.) Reduce 9670098 seconds to days.

(2.) 3 yrs. 19 d. 15 h. 45 m. to seconds.

(3.) 2 yrs. 240 d. 30 m. 43 sec. to seconds.

(4.) 1 yr. 16 d. 17 h. 25 m. × $41\frac{3}{5}$.

(5.) 25 yrs. 69 d. 17 h. 25 sec. ÷ $41\frac{4}{5}$. Find quotient and remainder.

(6.) 116 yrs. 363 d. 23 h. 50 m. 48 sec. ÷ $17\frac{3}{4}$. Find complete quotient.

(7.) 16 yrs. + 759 d. + 967 h. + 843 m.

(8.) Find how many periods of 3 h. 16 m. are contained in 9 wks. 5 d. 7 h., and what time would remain.

(9.) Reduce $\frac{6}{11}$ d. to minutes only.

(10.) Reduce $\frac{3}{4}$ sec. to the fraction of $\frac{5}{6}$ m.

(11.) Find the value of $\frac{5}{9}$ day.

(12.) If 3 yrs. 25 d. be $\frac{5}{8}$ of a certain period, what is the whole period?

Find by practice:—

(13.) 16 d. 6 h. @ 5s. 6d. per day, reckoning a working day at 9 hours.

(14.) 11 d. 7 h. @ 4s. 5d. per day.

(15.) 8 mo. 3 wks. 3 d. @ £6, 10s. per mo., reckoning 6 days to the week, and 4 weeks to the month.

(16.) 3 yrs. 9 mo. 45 d. at £120 per annum, reckoning 30 days to the month, and 12 months to the year.

(17.) How many days are there between 15th January and 29th September, the days mentioned to be reckoned as 1 day?

(18.) How many between 19th February 1872 and 17th March 1873?

(19.) How many between 13th April 1871 and 14th August 1873?

(20.) A watch loses 3 m. 7 sec. daily. If it agree with the correct time now at 20 m. to 1 P.M., what time will it shew exactly a week hence?

(21.) How many seconds are there between 13th May @ 10 A.M. and 14th July at 3.30 P.M.?

(22.) If a man can do $\frac{3}{5}$ of a piece of work in a day, in what time could he do the whole of it, reckoning 10 hours as a working day?

(23.) If a person can walk $2\frac{1}{2}$ miles in $1\frac{1}{4}$ hours, in what time will he walk $\frac{3}{4}$ of a mile?

(24.) If 6 masons can build a wall 30 yds. long, 6 ft. high, and 1 ft. thick in 7 days, working 9 hours a day, how many hours a day must 8 masons work to build one 20 yds. long, 5 ft. high, and $1\frac{1}{2}$ ft. thick, in 5 days?

(25.) At what time will I reach the town, a distance of 6 miles, if I leave at 6.15 A.M., and walk at the rate of $4\frac{1}{2}$ miles an hour?

(26.) A servant's wages are £17 per annum. She enters on the 13th August and leaves on 14th December. How much should she receive, reckoning the days mentioned as two days?

(27.) The seaside is 9 miles distant from the village. John starts from the seaside to walk to the village at 7 A.M., at the rate of 3 miles an hour, and James starts from the village to walk to the seaside at 7.30 A.M., at the rate of 4 miles an hour. At what time will they meet?

PRIME FACTORS.

LXIX.

(1.) Write out a table of prime numbers from 1 to 97.

Resolve into their prime factors :—

(2.) 2744, 3267, 1800, 3146, 30184.

(3.) 11025, 67500, 6615, 397488.

(4.) 779625, 78166, 199584, 46305.

(5.) 18144, 136125, 847847, 593021.

Find the square root of 8100.

$8100 = 2^2 \times 3^4 \times 5^2$. $\therefore \sqrt{8100} = 2 \times 3^2 \times 5 = 90$.

Find the cube root of 216000.

$216000 = 2^6 \times 3^3 \times 5^3$. $\therefore \sqrt[3]{216000} = 2^2 \times 3 \times 5 = 60$.

Any root of a number may be found thus when the number can be easily resolved into its prime factors, and the root is not fractional.

(6.) Find the square root of 2108304, 5531904.

(7.) Find the cube root of 2000376, 42875000.

(8.) $\sqrt[4]{49787136}$, $\sqrt[5]{1889568}$.

GREATEST COMMON MEASURE.

Terms to be explained :—*Measure, common measure, greatest common measure.* LXX.

Find the G. C. M. of—

(1.) 36, 48. *Ans.* 12.	(14.) 728, 952.
(2.) 48, 64. *Ans.* 16.	(15.) 228, 1005.
(3.) 51, 68. *Ans.* 17.	(16.) 271, 397.
(4.) 77, 119.	(17.) 1111, 1133.
(5.) 171, 261.	(18.) 963, 1017.
(6.) 248, 328.	(19.) 1027, 1261.
(7.) 396. 117.	(20.) 1357, 1541.
(8.) 2891, 3479.	(21.) 2040, 1608.
(9.) 684, 828.	(22.) 3435, 5725.
(10.) 349, 409.	(23.) 10746, 4842.
(11.) 402, 1002.	(24.) 62122, 36401.
(12.) 936, 918.	(25.) 18701, 26037.
(13.) 476, 644.	(26.) 11092, 15812.

(27.) 438, 730, 1679.	(29.) 1352, 1976, 1508.
(28.) 1903, 2519, 3091	(30.) 6327, 29748, 2553.

(31.) 2007, 2439, 3333. (33.) 876, 948, 714, 1068.
(32.) 344, 472, 684, 568. (34.) 2892, 2169, 2410, 1687.

(35.) $2^2 \times 5^2 \times 7 \times 3$ and $2^2 \times 5 \times 7^2$. *Ans.* $2^2 \times 5 \times 7 = 140$.

(36.) $2 \times 3^2 \times 11 \times 13$ and $2^3 \times 3^2 \times 7 \times 11^2$.

(37.) $2^2 \times 3^2 \times 5^2 \times 7 \times 11$ and $3^2 \times 5 \times 7^2 \times 13$.

(38.) $121\frac{4}{7}$ and $104\frac{1}{7}$; $12\frac{2}{3}$ and 6.

(39.) Write down all the divisors of 540.

(40.) Write down all the divisors of 8281.

LEAST COMMON MULTIPLE.

Terms to be explained :—*Multiple, common multiple, least common multiple* (*L. C. M.*).

LXXI.

Find the L. C. M. of—

(1.) 9, 12. *Ans.* 36.
(2.) 21, 28. *Ans.* 84.
(3.) 48, 56.
(4.) 108, 72.
(5.) 96, 140.
(6.) 196, 274.
(7.) 397, 475.
(8.) 894, 798.
(9.) 9605, 7684.
(10.) 11622, 9834.
(11.) 8, 3, 9, 12. *Ans.* 72.
(12.) 7, 4, 21, 9. *Ans.* 252.
(13.) 9, 11, 12, 14.
(14.) 12, 13, 15, 9.
(15.) 18, 21, 7, 9, 5.
(16.) 19, 16, 8, 24, 4.
(17.) 9, 16, 18, 24, 36, 48.
(18.) 15, 25, 48, 72, 12, 14.
(19.) 29, 39, 49, 13, 21, 7.
(20.) 10, 105, 189, 1001, 99, 11.
(21.) 16, 18, 15, 20, 21, 22, 24.
(22.) 12, 14, 15, 16, 18, 20, 25, 30.
(23.) 24, 36, 48, 60, 72, 84, 96.
(24.) 14, 25, 21, 15, 18, 36, 28.
(25.) 432, 4, 69, 12, 23, 115.
(26.) 11, 111, 1100, 1221, 110, 3, 10.

(27.) $2^2 \times 5^2 \times 7 \times 3$ and $2^2 \times 5 \times 7^2$. *Ans.* $2^2 \times 3 \times 5^2 \times 7^2 = 29400$.

(28.) $2 \times 3^2 \times 11 \times 13$ and $2^3 \times 3^2 \times 7 \times 11^2$.

(29.) $2^2 \times 3^3 \times 5^2 \times 7 \times 11$ and $3^2 \times 5 \times 7^2 \times 13$.

(30.) $2\frac{1}{3}$, $5\frac{1}{2}$, 7.

(31.) $\frac{4}{5}$, $\frac{6}{7}$, $\frac{11}{12}$.

VULGAR FRACTIONS—(*continued*).

LXXII.

Reduce to their lowest terms :—

(1.) $\frac{884}{1292}$. *Ans.* $\frac{13}{19}$.

(2.) $\frac{972}{1053}$. *Ans.* $\frac{12}{13}$.

(3.) $\frac{1242}{2169}$, $\frac{2227}{8041}$.

(4.) $\frac{2556}{3924}$, $\frac{924}{1056}$.

(5.) $\frac{1139}{1206}$, $\frac{11424}{30240}$.

(6.) $\frac{20729}{21090}$, $\frac{17871}{20424}$.

(7.) $\frac{1358016}{7197531}$, $\frac{1818180}{3454542}$.

(8.) $\frac{2769723}{2809719}$, $\frac{38777739}{45333399}$.

Reduce to their L. C. D. :—

(9.) $\frac{2}{3}, \frac{5}{6}, \frac{3}{4}, \frac{1}{2}$. *Ans.* $\frac{8, 10, 9, 6}{12}$.

(10.) $\frac{4}{5}, \frac{3}{10}, \frac{7}{8}, \frac{3}{4}$. *Ans.* $\frac{32, 12, 35, 30}{40}$.

(11.) $\frac{2}{3}, \frac{5}{9}, \frac{5}{6}, \frac{7}{9}$.

(12.) $\frac{5}{8}, \frac{5}{6}, \frac{2}{5}, \frac{1}{3}$.

(13.) $\frac{2}{3}, \frac{7}{10}, \frac{11}{15}, \frac{5}{12}$.

(14.) $\frac{4}{10}, \frac{7}{100}, \frac{11}{1000}, \frac{13}{10000}$.

(15.) $\frac{7}{22}, \frac{9}{33}, \frac{13}{44}, \frac{17}{55}$.

(16.) $\frac{6}{9}, \frac{4}{7}, \frac{5}{15}, \frac{7}{11}$.

(17.) $\frac{7}{9}, \frac{2}{3}, \frac{11}{18}, \frac{5}{27}$.

(18.) $\frac{4}{15}, \frac{6}{13}, \frac{5}{18}, \frac{7}{22}$.

(19.) $\frac{9}{20}, \frac{13}{18}, \frac{4}{15}, \frac{2}{9}, \frac{5}{6}$.

(20.) $\frac{7}{10}, \frac{6}{21}, \frac{9}{14}, \frac{11}{15}, \frac{5}{12}$.

Arrange the following in order of magnitude :—

(21.) $\frac{7}{8}, \frac{9}{10}, \frac{24}{30}, \frac{11}{25}, \frac{7}{30}, \frac{5}{12}$.

(22.) $\frac{4}{15}, \frac{17}{30}, \frac{19}{20}, \frac{12}{25}, \frac{13}{40}, \frac{9}{30}$.

(23.) $19\frac{1}{2} + 14\frac{2}{3} + 29\frac{11}{21} + 13\frac{5}{7} + \frac{11}{14}$; $101\frac{19}{28}$, $+99\frac{13}{14} + 76\frac{5}{7} + \frac{21}{30}$.

(24.) $\frac{6}{7}$ of $\frac{14}{15} + \frac{9}{11}$ of $\frac{22}{27} + \frac{1}{3}$ of 9 ; $1\frac{1}{2}$ of 3 of $\frac{11}{12} + 8\frac{3}{4}$ of $1 + 4\frac{1}{12}$ of 9.

(25.) $5\frac{3}{4}$ of $7\frac{1}{2} + 8\frac{2}{5} + 7\frac{3}{8}$ of $11\frac{5}{9} + 64\frac{2}{3}$; $4654\frac{6}{7}$ of $4\frac{1}{2} + 6983\frac{9}{14} + 86\frac{11}{28} + \frac{1}{56}$.

(26.) $\frac{15}{28} - \frac{12}{32}, \frac{19}{30} - \frac{14}{25}, \frac{23}{42} - \frac{20}{49}, \frac{24}{35} - \frac{41}{51}$.

(27.) $8967\frac{4}{11} - 6845\frac{19}{44}$, $76841\frac{5}{21} - 9784\frac{9}{28}$.

(28.) $6859\frac{24}{25} - 4859\frac{17}{18}$, $1000\frac{7}{10} - 999\frac{97}{100}$.

(29.) $16\frac{11}{15} - 19\frac{6}{25} - 17\frac{4}{9} + 31\frac{12}{35}$; $18\frac{4}{9} - 25 + \frac{5}{27} + 40\frac{1}{8} - 1\frac{11}{12}$.

(30.) $9\frac{1}{8} - (2\frac{3}{10} + 4\frac{7}{15})$; $(6\frac{4}{5} - 2\frac{3}{10}) + 4\frac{7}{15}$.

(31.) $29\frac{6}{7} - (8\frac{3}{14} - 7\frac{11}{21} + 4\frac{5}{6})$; $29\frac{6}{7} - 8\frac{3}{14} - (7\frac{11}{21} + 4\frac{5}{6})$.

NOTE.—The sign ∽ signifies "difference between."

(32.) $\frac{6}{7}$ of $\frac{5}{9}$ ∽ $\frac{7}{12}$ of $\frac{3}{4}$; $\frac{5}{14}$ of $\frac{7}{10}$ ∽ $1\frac{1}{15}$ of $\frac{5}{12}$.

(33.) $4\frac{1}{2}$ of $\frac{7}{9}$ ∽ $3\frac{1}{8}$ of $6\frac{7}{10}$; $8\frac{11}{12}$ of $5\frac{5}{6}$ ∽ $\frac{6}{7}$ of $4\frac{3}{4}$.

(34.) $\frac{6}{7}$ of $\frac{5}{11}$ of $\frac{14}{15}$ ∽ $\frac{3}{4}$ of $4\frac{5}{6}$ of 9.

(35.) $6\frac{4}{9}$ of $7\frac{5}{18}$ of 1 ∽ $1\frac{1}{12}$ of $6\frac{2}{3}$ of $9\frac{6}{11}$ of 7.

(36.) Tell by inspection which of the following fractions are greater than one-half :—$\frac{157}{317}$, $\frac{34568}{79866}$, $\frac{89064}{175693}$.

(37.) Which of the following are greater than one-third ?—$\frac{764}{23897}$, $\frac{96458}{179864}$, $\frac{695698}{1899649}$.

(38.) Find a fraction with D. 10 approximating in value to $\frac{349}{405}$.

(39.) Find one with D. 20 approximating in value to $\frac{173}{219}$.

(40.) Find one with D. 12 approximating in value to $\frac{357}{367}$.

MISCELLANEOUS EXERCISES.

LXXIII.

(1.) One measure contains 3 gallons, another 5, and another 7. What is the smallest number of gallons a barrel must contain, so that it may be emptied by filling any of them an exact number of times.

(2.) Simplify $3\frac{1}{6} + (6\frac{7}{10} \div 8\frac{1}{18}) - (8\frac{9}{20} \div 11\frac{4}{15})$.

(3.) Simplify $2\frac{29}{81}$ of $\cfrac{5}{5+\cfrac{6}{6+\frac{3}{9}}}$

(4.) The distance from Edinburgh to Carlisle by the Caledonian Railway is 101 miles. If two trains start at the same time from E. and C., one at the rate of 15 miles, and the other at the rate of 20 miles an hour, when will they meet, and how far from Edinburgh?

(5.) Find by practice the price of 1 ton 3 cwts. 21 lbs. $3\frac{1}{2}$ oz. @ £4, 11s. $7\frac{1}{2}$d. per ton.

(6.) Find the net weight of 18 cwts. 3 qrs. 21 lbs. Tare 16 lbs. per cwt. Tret as usual.

(7.) A merchant bought two parcels of the same kind of tobacco, weighing respectively 1 cwt. 2 qrs. 25 lbs., and 1 cwt. 1 qr. 27 lbs. The cost of the former was £5, 17s. more than the cost of the latter. Find the price per cwt.

(8.) Express 11 oz. 15 dwts. 21 grs. in ounces and grains av. weight.

(9.) A person bought $2\frac{1}{2}$ gallons of spirits. After 1 gallon 3 qts. of it was used, what part of the whole was left?

(10.) A tax of £354, 12s. is paid by an equal number of bushels of wheat, barley, and oats. How many bushels of each kind will be received when wheat sells at 6s. 8d., barley at 5s. 6d., and oats at 4s. 3d. per bushel?

(11.) If $\frac{2}{3}$ of $5\frac{1}{2}$ gallons cost 6s. 6d., what is the price of $\frac{3}{5}$ of $6\frac{1}{4}$ pks.?

(12.) Find the difference between 1 mile and 7 fur. 39 po. 5 yds. 1 ft. 11 in.

(13.) Two-thirds of the height of a wall was blown down. The proprietor added 6 ft. to it, and then found it was just $\frac{4}{5}$ of the original height. How high was it at first?

(14.) Reduce 712647 sq. yds. to acres.

(15.) If $\frac{1}{3}$ of A's money equal $\frac{2}{5}$ of B's, what part of B's will equal $\frac{2}{7}$ of A's.?

(16.) By selling a house for £1150 I gained $\frac{6}{17}$ of what it cost me. How much did I pay for it?

(17.) Two pieces of beef of the same weight cost respectively 7s. $1\frac{1}{2}$d. and 8s. 3d. The price of the first was $9\frac{1}{2}$d. per lb., what was the price per lb. of the other?

(18.) Reduce 1100 oz. troy to oz. av.

(19.) Add $\frac{1}{3}$ of £76, 18s. 4d., $\frac{1}{8}$ of £121, 14s. $11\frac{1}{2}$d., and $\frac{1}{7}$ of £91, 11s. $9\frac{3}{4}$d.

(20.) From $\frac{1}{3}$ of £961, 17s., $4\frac{1}{4}$d. take $\frac{1}{8}$ of £1021, 11s. $9\frac{3}{4}$d.

(21.) Two tracts of land consisted respectively of 798 and 966 acres. What is the smallest number of farms, each containing the same exact number of acres, into which they could be divided, and how many acres would there be in each?

(22.) The third class fare per mile by a certain railway is $\frac{8}{9}$ of that of the second class, which is $\frac{7}{10}$ of that of the first class, which is $1\frac{11}{245}$ of $3\frac{1}{2}$d. What is the third class fare per mile?

(23.) The length of A's step is 2 ft., of B's $2\frac{1}{2}$ ft., and of

C's 3 ft. What is the shortest distance they might walk so as to complete it in an exact number of steps?

(24.) What is the largest number that will divide 2087 and 1521 so as to leave remainders 8 and 9.

(25.) What is the smallest number which, when divided by 2, 3, 4, 5, 6, 7, 8, or 9, always leaves a remainder of 1?

(26.) A and B can do a piece of work in 5 days, A and C in 6 days, and B and C in 8 days. In how many days could A do it alone?

(27.) A cistern can be filled in $1\frac{1}{2}$ hours by A, in $4\frac{1}{2}$ hours by B, and emptied in $2\frac{2}{3}$ hours by C. If all three pipes were set running when the cistern was empty, in how many hours would it be filled?

(28.) Simplify $\frac{5\frac{3}{8}+4\frac{1}{6}}{4\frac{5}{6}-2\frac{1}{3}} \div \frac{6\frac{1}{5}-3\frac{7}{10}}{5\frac{7}{30}-3\frac{3}{10}}$ of $\frac{3\frac{3}{5} \text{ of } \frac{2}{11}}{3\frac{1}{2} \div 4\frac{2}{3}}$.

(29.) Divide $\frac{4}{5}$ $\left(\frac{569\frac{1}{2}}{475\frac{2}{3}} \times \frac{89\frac{4}{5}-16\frac{3}{5}}{101\frac{1}{6}+18\frac{5}{9}} \div \frac{16\frac{1}{4} \div 17\frac{2}{3}}{18\frac{3}{4} \times 19\frac{7}{12}}\right) \times \frac{1001\frac{9}{11}}{18\frac{2}{3}}$ by $\frac{1}{5}$ of itself.

(30.) Simplify $\cfrac{1}{1+\cfrac{1}{10+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{4}}}}}}$

(31.) A B and C set out on a journey in the same direction. A travels at the rate of 30, B at the rate of 6, and C at the rate of 12 miles an hour. What is the shortest distance they must travel, so that they may all arrive at the same place after having travelled each an exact number of hours?

(32.) John finds that he can arrange his marbles in 7 equal heaps, or in 12 equal heaps, and likewise in 9 equal heaps. He has not so many as 260. How many has he?

(33.) Simplify $1\frac{1}{15} \div (8\frac{3}{4} \times \frac{2}{5})$ of $\left(6\frac{1}{8} \div \frac{8\frac{1}{2}}{4\frac{2}{3}}\right)$.

(34.) The ratio of A to B is as 4 to 5, and of B to C as 6 to 7. What is the ratio of A to C?

(35.) A can do a piece of work in $4\frac{2}{3}$ days, B in $4\frac{1}{2}$ days,

and C in $3\frac{1}{2}$ days. In how many days could A and B do it together? or A and C do it together?

(36.) A contractor can finish a work in 106 days by employing 70 men, but after they have worked for 52 days, he is required to finish it in 36 days more. How many more men will he require to engage?

(37.) During one day at the diggings A found gold to the value $£3\frac{5}{8}$, B to the value of $£1\frac{1}{2}$ more than A. If C had found $£\frac{1}{3}$ more he would have had twice as much as A and B together. If A and C were to exchange, how much money would A have to give to C?

(38.) The weekly wages of 9 men and 11 women amount to £10, 7s. Each man receives $\frac{1}{3}$ more than each woman. What is the daily wage of a woman?

(39.) What is the smallest sum of money with which a dealer may purchase either chickens at 1s. 9d., rabbits at 1s. 3d., geese at 2s. 6d., or pigeons at 9d. each?

(40.) A lady goes to market and spends $\frac{1}{5}$ of the money she has in her purse in one shop, $\frac{3}{8}$ of the remainder in another shop, and has then £1, 19s. $0\frac{3}{4}$d. left. How much had she at first?

(41.) Simplify $\dfrac{\frac{117}{234}+\frac{351}{468}}{\frac{585}{702}-\frac{351}{468}}$

(42.) Two diggers A and B found that at the end of a month they had in their bag 1 lb. 5 oz. 11 dwts. of gold. A was to receive $\frac{1}{5}$ more than B. What was the value of A's share at £3, 17s. per oz.?

(43.) How often may a jug holding $\frac{7}{8}$ of a pint be filled from a firkin of beer? and how much will remain after the last jugful has been drawn?

(44.) If a merchant purchase 1500 gals. of spirits for £575, and after losing some by an accident, gain £106, 17s. 6d. by selling the remainder at 12s. 6d. per gal. How many gallons of the spirits were lost?

(45.) If 360 gals. of spirits cost £215, 10s. 9d., how many gallons of water must be added to reduce the value to 10s. 9d. per gal.?

(46.) Reduce to its lowest terms :—

$$\frac{9 \text{ ac. } 1 \text{ ro. } 32 \text{ po.}}{28 \text{ ac. } 1 \text{ ro. } 16 \text{ po.}} \text{ of } \frac{7 \text{ lbs. } 8 \text{ drs.}}{10 \text{ lbs. } 6 \text{ oz. } 12 \text{ drs.}} \text{ of } \frac{1 \text{ qt. } 1 \text{ pt. } 3 \text{ gills}}{2 \text{ qts. } 1 \text{ pt.}}$$

(47.) What is the expense of papering the walls of a room 20 ft. long, 16 ft. broad, and 12 ft. high, with paper 1 yd. broad, at 1s. 6d. per lineal yard, allowing for 3 doors, each 4 ft. by 7 ft., and 2 windows, each $6\frac{1}{2}$ ft. by $3\frac{1}{2}$ ft. ?

(48.) 5 yds. 2 ft. × 3 yds. 1 ft. 8 in. × 2 ft. 11 in.

(49.) A piece of copper 2 ft. long, 10 in. wide, and 6 in. thick, is rolled into a plate 6 in. broad, and $\frac{1}{12}$ in. thick. How long will it be ?

(50.) What is the average time of 3 d. 17 h., 5 d. 21 h., 6 d. 13 h., and 1 wk. 4 d. ?

(51.) What is the supplement of 81° 49′ 52″ ? What the complement ?

(52.) What part of 4 right angles is equal to $\frac{4}{5}$ of 1 right angle ?

(53.) Reduce 220 half-guineas to half-crowns, and divide the result by $\frac{2}{3}$, expressing the answer in £. s. d.

(54.) A gentleman's expenses = $\frac{3}{4}$ of his income, his taxes = $\frac{1}{15}$ of his income, and he saves £150. What is his income ?

(55.) Simplify $\cfrac{4}{6 + \cfrac{9}{8 + \cfrac{4}{6 + 4\frac{2}{7}}}}$

(56.) Several workmen in a building-yard begin to use their hammers simultaneously. One gives a stroke every 3 sec., another every 4 sec., another every 6 sec., another every 8 sec., and another who yields a very heavy hammer every 15 sec. When will they all strike simultaneously again ?

(57.) Simplify $\dfrac{7\frac{4}{5} - 5\frac{5}{6}}{9\frac{7}{15} - 1\frac{2}{5}} \div \dfrac{6\frac{4}{5} - 3\frac{7}{15}}{5\frac{1}{4} - 2\frac{2}{5}\frac{3}{4}}$ of $\dfrac{\frac{7}{8} \text{ of } \frac{8}{7}}{\frac{5}{8} \text{ of } \frac{4}{5}}$.

(58.) One part of a post which is $\frac{2}{5}$ of the whole is painted red, another which is $\frac{4}{7}$ of the red part is painted blue, another which is $\frac{7}{11}$ of the blue part is painted white,

and the rest which is 4 ft. long is painted black. Find the length of the post.

(59.) There are two heaps of bricks, one consisting of 99936 bricks, and the other of 114336 bricks. What is the largest number that must be put into each cart, so that they may be carted off by an exact number of cart-loads from each heap, and how many cart-loads would there be?

(60.) If a person lose $\frac{1}{7}$ of his money in a speculation, then $\frac{2}{3}$ of the remainder, then $\frac{1}{7}$ of the rest, and now finds he has $\frac{4}{5}$ of £450 left, how much had he at first?

(61) If £$\frac{1}{4}$ purchase $\frac{2}{3}$ yd. of cloth when it is $\frac{1}{4}$ over its average price, how much will £$\frac{1}{8}$ purchase when it is $\frac{1}{3}$ below its average price?

(62.) If a man can do as much work as 3 boys, and if 5 men and 4 boys can dig a trench $35\frac{2}{3}$ ft. long, $4\frac{1}{2}$ ft. broad, and $2\frac{1}{4}$ ft. deep in 4 days, how many days will it take 3 men and 5 boys to dig one $26\frac{3}{4}$ ft. long, $6\frac{2}{3}$ ft. broad, and $3\frac{1}{2}$ ft. deep?

(63.) One winter a farmer provided food for 8 cows and 12 horses, and he found that 6 cows ate as much as 8 horses. What quantity of food relatively to the former must he provide the following winter for 16 cows and 10 horses?

(64.) A man was engaged for 28 days, and was to receive 2s. 6d. a-day for each day he worked, but was to pay 1s. 6d. for each day he was idle. He received in all £2, 10s. How many days was he idle?

(65.) Divide £4, 13s. 6d. among 6 men, 5 women, and 11 boys, giving each woman $\frac{3}{4}$ of a man's share, and each boy $\frac{2}{7}$ of a woman's share?

(66.) Supposing that $\frac{11}{560}$ by weight of a certain liquid is saline matter, and of this $\frac{7}{187}$ is magnesia, how many grains of magnesia will there be in 1 cu. ft. of the liquid if 40 cu. ft. equal 1 ton?

(67.) If $\frac{4}{5}$ of a bushel of apples be worth $\frac{3}{4}$ of a bushel of pears, and 4 bushels of pears be worth 9s., how many bushels of apples can be had for £2, 10s.?

(68.) A building consisting of three floors is 86 ft. long

and 45 ft. 6 in. broad. What is the expense of flooring it at £3, 10s. per square, allowing for 11 fire-places, each $4\frac{1}{2}$ ft. by 6 ft., in each floor, the space for a staircase 10 ft. square, and also for a kitchen 16 ft. by 11 ft. in each floor paved with stone?

(69.) A can mow 2 ro. 28 po. in 1 day, B 2 ac. 2 ro. 20 po. in $3\frac{1}{2}$ days, and C 4 ac. 20 po. in 5 days. What is the size of the smallest field which would employ any one of them an exact number of days? and in how many days would each finish the work?

(70.) If 96 lbs. of metal are lowered into a cistern full of water and 288 cubic inches of water overflow, what is the weight of a cubic foot of the metal?

(71.) 3 ft. 2′ 5″ × 2 ft. 3′ 4″ × 6 ft. 4′ 5″, and express the result as cubic yards, feet, and inches.

(72.) A man floating on the sea displaces $2\frac{1}{2}$ cubic feet of water. What is his weight supposing 35 cu. ft. of sea water to weigh 1 ton?

(73.) Eleven-twelfths of a sovereign is pure gold and the remainder of no value. What is the difference in value between 3 sovereigns and their weight in jewellery gold, which is two-thirds fine?

(74.) If a man can finish $\frac{1}{3}$ of a piece of work in $2\frac{1}{2}$ days, in how many days will he finish $\frac{1}{5}$ of the remainder?

(75.) Add together £$\frac{1}{7}$, $\frac{1}{8}$ cr., $\frac{1}{3}$ sh., $\frac{1}{4}$ threepenny-bit, and express the sum in terms of a fourpenny-piece.

(76.) From one end of a post $\frac{1}{3}$ is cut away, from the other end $2\frac{1}{2}$ ft. more, and then $\frac{1}{7}$ of the remainder. If $5\frac{1}{4}$ ft. are left, what was the length of the post at first?

(77.) A gentleman gave away a certain sum of money in charity. He gave $\frac{1}{4}$ of the sum and a shilling more to a poor man, $\frac{1}{3}$ of the remainder and a shilling more to a poor woman, and $\frac{1}{2}$ of the remainder and a shilling more to a poor child, by which time he had given away all he had. How much money did he give away

(78.) Simplify $\cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{2 + \frac{1}{16}}}}$

(79.) What is the greatest number by which, when 1587 and 973 are divided, 3 and 5 are left respectively as remainders?

(80.) What is the smallest number which can be divided by 5, 7, 9, or 11, and leave in each instance a remainder of $3\frac{1}{5}$?

(81.) John is 12 years of age. His father's age is equal to John's together with $\frac{3}{5}$ of John's age added to $\frac{3}{5}$ of his own. How old is the father?

(82.) At what time after 12 o'clock will the hands of a watch again coincide?

(83.) What is the first time after 2 o'clock at which the hands of a watch will be at right angles?

(84.) Tom started in a race 2 minutes before Henry. Tom runs at the rate of $\frac{1}{3}$ and Henry at the rate of $\frac{1}{4}$ of a mile in a minute. In what time will Henry overtake Tom?

(85.) At what time after 3 o'clock will the hands of a watch be in a straight line?

(86.) A, B, and C travel from the same place at the rate of 4, 6, and 8 miles an hour respectively. A starts at 6 A.M., and B at 8 A.M. When must C start in order that he and B may overtake A at the same time?

(87.) Two sets of men perform the same amount of work in the same time. The first set work 8 hours a-day for 6 days, and the second set work 9 hours a-day for $5\frac{1}{3}$ days, but each man in the second set is stronger than each man in the first set in the ratio of 5 to 4. If there were 10 men in the first set, how many were there in the second?

(88.) Divide 90 into 2 parts which shall have the ratio of 6 : 7.

(89.) A person paid £14, 8s. 9d. as income-tax, but after the tax was increased to 6d. he paid £19, 5s. What was his income, and at what rate was the tax levied at first?

(90.) An Austrian florin is worth 1s. $11\frac{1}{4}$d. Find the smallest number of florins that can be given in exchange for an exact number of English crowns.

(91.) A stationer lost $\frac{3}{8}$ of his stock by fire, and $\frac{5}{8}$ of the

remainder was damaged by water. He sold the injured goods at $\frac{1}{4}$ of cost price, and the others at cost price, and realised £133. How much did he loose by the fire?

(92.) A gamekeeper was engaged for 1 year at the salary of £60, 10s. and two guns. He left at the end of 8 months, and received £35, 1s. 8d. and the guns. What was the value of each gun?

(93.) A person in retailing beer used a measure holding only $\frac{9}{10}$ of a quart for which he charged $4\frac{1}{2}$d. What is the price of a true quart at this rate? and how much did he gain on every barrel?

(94.) A garden, 25 yds. by 40 yds., is enclosed by a wall 10 ft. high and 2 bricks thick. What was the expense of building it at 30s. per rod standard measure, allowing for a doorway 4 ft. by 7 ft.?

(95.) The weight of maple being to that of water as 3 to 4, how many cubic feet are there in a ton of maple, if 1 cu. ft. of water weigh 1000 ounces.

(96.) If wood weigh 2 tons 5 cwts. to the cubic yard, what is the measurement of a ton?

DECIMAL FRACTIONS.

LXXIV.

Example :—$\frac{365}{1000} = \frac{300}{1000} + \frac{60}{1000} + \frac{5}{1000} = \frac{3}{10} + \frac{6}{100} + \frac{5}{1000}$ = ·365.

(1.) Analyse in a similar manner :—$\frac{76}{100}$, $\frac{911}{1000}$, $\frac{84}{1000}$.

(2.) Express in words the separate value of each figure in the following :—76·45, ·087, ·01901.

(3.) What is the difference between 345 thousandths and 3 tenths + 4 hundredths + 5 thousandths?

Express as decimal fractions :—

(4.) $\frac{45}{10}$, $\frac{48}{10}$, $\frac{453}{10}$, $\frac{472}{100}$, $\frac{74}{10}$, $\frac{145}{100}$, $\frac{29}{100}$, $\frac{8}{100}$.

(5.) $\frac{9}{10}$, $\frac{72}{100}$, $\frac{83}{1000}$, $\frac{17}{10000}$, $\frac{11}{10}$, $\frac{11}{1000}$, $\frac{101}{1000}$, $\frac{110}{10000}$.

(6.) Four tenths; five hundredths; three thousandths; six millionths; fifty-seven tenths.

(7.) Sixty-nine hundredths; eighty-three thousandths; one hundred and forty-three millionths; eighteen billionths; five hundred and forty-seven trillionths.

(8.) 3 tenths + 45 thousandths (*Ans.* ·345) ; 3 thousandths + 5 millionths ; 2 tenths + 6 thousandths + 17 millionths.

(9.) 4 hundred + 5 tenths + 1 millionth ; 15 hundred + 25 tenths + 13 millionths ; 1 thousandth + 1 millionth + 1 billionth + 11 trillionths.

(10.) Multiply 1·7 by 10, by 100 (*Ans.* 17, 170) ; ·019 by 10, by 1000.

(11.) 89·17 by 100, by 10000 ; ·00189 by 1000, by 100000.

(12.) ·6 × 10, 1·09 × 100, ·00081 × 1000.

(13.) Divide 89 by 10, by 100 (*Ans.* 8·9, ·89.) ; 6·4 by 10, by 100.

(14.) ·6 by 100, by 1000 ; ·016 by 10, by 1000.

(15.) 1·037 by 100, by 1000; 45·0013 by 10000, by 1000000.

Express as vulgar fractions :—

(16.) ·8 (*Ans.* $\frac{4}{5}$), ·08 (*Ans.* $\frac{2}{25}$), ·008, 7·2, 2·25, ·225.

(17.) ·0016, 1·021, 31·0035, 3·96, ·396, 39·6.

(18.) ·14, ·014, ·0014, ·0104, 1·104, 10·0104.

A decimal fraction may be expressed approximately as follows :—·69451372 by ·7, ·69, ·695, ·6945, ·69451, &c., which are said to be correct to the 1st, 2d, 3d places, &c. When the rejected figure is 5, 6, 7, 8 or 9, the preceding figure is increased by 1.

Express the following approximately rejecting each figure in succession.

(19.) 1·453262, ·897213.

ADDITION OF DECIMAL FRACTIONS.

LXXV.

(1.)
2·731
·0093
61·16
·091
63·9913

(2.)
14·00831
·16003
4·91
256·019
10·1131

(3.)
·0083
1·0831
10·8312
108·3123
·1083123

(4.) 16·345 + 9·83 + 456·5 + ·8942 + ·0081 + 1·19.

(5.) ·681 + ·32 + ·6483 + ·0681 + ·32009 + ·632.

(6.) 4·9 + ·003 + 19·1601 + 89·3 + 6·019 + 18·0032.

(7.) 6·831 + ·4567 + 291 + ·00871 + 24·613 + 17·41.

(8.) 671 + ·00671 + 6·716 + 896·4001 + 23·89764 + 5689·1.

(9.) 89781 + 8978·1 + 897·81 + 89·781 + 8·9781 + ·89781.

(10.) ·00678 + ·0678 + ·678 + 6·78 + 67·8 + 678.

(11.) 986·764 + 9867·64 + 98·6764 + 98676·4 + 9·86764 + 986764.

(12.) 67800 + ·00678 + 6780 + ·0678 + 678 + ·678 + 67·8 + 6·78.

SUBTRACTION OF DECIMAL FRACTIONS.

LXXVI.

(1.) 18·0196 − 9·9874 = 8·0322

(2.) 61·83 − 59·764 = 2·066

(3.) 1·96451 − ·975 = ·98951

(4.) 689·4567 — 542·964.

(5.) ·643 — ·45987.

(6.) 683 — ·683.

(7.) ·8361 — ·00964.

(8.) 1 — ·98764.

(9.) 743·89 — 98·45671.

(10.) ·001 — ·00001.

(11). 63214·6 — 6·32146.

(12.) 17·61 — 8·0097.

Find the value of—

(13.) 14·96 + 25·1 — 36·03 + 17·009 — ·6543.

(14.) 693 — 69·3 — 6·93 — ·693 — ·0693.

(15.) ·743 — 9·63 + 7·43 — 96·3 + 74·3 — 963 + 7430.

(16.) 1000 — ·0001 + 100 — ·001 + 10 — ·01 + 1 — ·1.

MULTIPLICATION OF DECIMAL FRACTIONS.

LXXVII.

(1.) 4·76 × 9 (*Ans.* 42·84; 8·3 × 11 (*Ans.* 91·3.

(2.) ·61 × 12; ·00364 × 8.

(3.) 5·67 × ·8; 4·32 × ·11.

(4.) ·831 × ·7 ; ·0009 × ·0012.

(5.) 6·034 × 25 ; 8·61 × 36.

(6.) ·413 × 7·9 ; 6·4003 × 361.

(7.) 36·451 × ·25 ; 8·321 × 2·5.

(8.) 6·834 × ·0025 ; 3·006 × 1·0025.

(9.) 1·01 × 10·1 × ·101 ; 345 × 3·45 × 34·5 × ·345.

(10.) $1·21^2$; $2·001^2$.

(11.) $·101^3$; $2·1^4$.

(12.) (2·04 + ·321) × 1·03 ; $1·1^3 - 1.01^3$.

NOTE.—The product may be found correct to any required number of decimal places, as in the following example :— 16·897654 × 2·897683, correct to 3 decimal places. Write the multiplier in inverted order, placing the units under the fourth decimal place of the multiplicand, that is one place more than the number required in the answer. Multiply the multiplicand by each figure in the multiplier, rejecting those on the right, but carrying from them when necessary. Mark off 4 places in the answer, rejecting 1 on the right.

16·897654
386 7982

337953
135181
15208
1183
101
13

48·964 9.

Find correct to 3 places :—

(13.) 109·765473 × 2·009683.

(14.) ·3675481 × ·1009683.

(15.) 1·0096732 × ·00968376.

Find correct to 4 places :—

(16.) 168·48314 × 769·8321.

(17.) 11·1019101 × 12·0101836.

(18.) $·4631^2$, $1·2683^2$.

DIVISION OF DECIMAL FRACTIONS.

LXXVIII.

(1.) 1·0087 ÷ 11, ·11, ·0011. *Ans.* ·0917, 9·17, 917.

(2.) 89·613 ÷ 9, ·9, ·09.

(3.) ·3 ÷ 15, 3 ÷ ·0015.

(4.) ·6147 ÷ ·09, 2 ÷ 125.

(5.) 1·400949936 ÷ ·00314, 4·625747 ÷ 4·69

(6.) ·00964 ÷ ·00032, 31·6098971212 ÷ 243·8452.

Find correct to 6 places :—

(7.) 1·86141 ÷ 66·1, 18614·1 ÷ 6·61.

(8.) ·08713 ÷ 1·001, 87·13 ÷ 100·1.

(9.) 306·3211 ÷ 123·4, 116·3201 ÷ 29·43.

(10.) 11·004893 ÷ 1196·13, 7·2003 ÷ 17·00037.

Find correct to 5 places :—

(11.) $(4{\cdot}31)^2 \div (3{\cdot}02)^2$; $(1{\cdot}001)^2 \div (1{\cdot}01)^2$

(12.) $\dfrac{16{\cdot}431 + 2{\cdot}31}{{\cdot}0039}$; $\dfrac{1{\cdot}096 + 13{\cdot}16}{2{\cdot}31 - 1{\cdot}299}$.

NOTE. — After having found the integral part of the quotient, the decimal part may be found sufficiently correct to a certain number of places by rejecting the figures of the divisor in succession, instead of bringing down other figures from the dividend, as in the following example :—

13·45689 ÷ 4·6832

4,6,8,3,2) 134568·9 (2·8734

93664

40904

37466

3438

3278

160

141

19

19

Find correct to 4 places :—

(13.) 7·68459 ÷ 2·32145, ·0697654 ÷ ·038761.

(14.) 1·809 ÷ 456·4589, 16·4891 ÷ 269·00961.

LXXIX.

Reduce to Decimals :—

(1.) $\frac{3}{5}$, $\frac{4}{25}$, $\frac{6}{125}$. *Ans.* ·6, ·16, ·048.

(2.) $\frac{57}{8}$, $\frac{100}{125}$, $2\frac{2}{4}$, $4\frac{5}{8}$, $\frac{1}{2}$ of $\frac{4}{5}$.

(3.) $\frac{99}{16}$, $\frac{142}{625}$, $\frac{49}{160}$, $13\frac{45}{128}$, $8\frac{11}{16}$.

(4.) $194\frac{825}{1024}$, $306\frac{1}{1250}$, $31\frac{831}{6250}$, $2\frac{1}{5}$ of $3\frac{7}{10}$.

(5.) $2\frac{1}{2}$ of $3\frac{1}{4}$ of $4\frac{1}{8}$, $1\frac{1}{2}$ of $1\frac{1}{4}$ of $1\frac{1}{5}$, $\frac{3}{4} + \frac{1}{2} + \frac{5}{8}$.

(6.) $\frac{2}{5} - \frac{6}{25} + \frac{5}{8}$, $\frac{3}{5} + \frac{4}{5} + \frac{3}{4} + \frac{5}{6}$, $2\frac{3}{10} + 6\frac{5}{6} - \frac{4}{5} + 5\frac{7}{15}$.

(7.) $\dfrac{\frac{4}{5}}{6\frac{1}{4}}$, $\dfrac{1\frac{1}{3}}{1\frac{2}{3}} \times \dfrac{1\frac{3}{4}}{2}$, $\dfrac{3 \times 5 \times 6}{2 \times 10 \times 9}$.

(8.) $\frac{7\times15\times18}{27\times14\times20}$, $\frac{4\frac{1}{2}\times3\times11\frac{3}{4}}{6\frac{1}{4}\times3\frac{1}{4}}$, $\frac{4-(\frac{1}{3}\text{ of }\frac{5}{7})}{\frac{2\frac{1}{3}}{2}+\frac{2}{2\frac{1}{3}}}$

Terms to be explained:—*Repeating and circulating decimals, pure repeating or circulating decimals, mixed repeating or circulating decimals, period or repetend.*

Reduce to decimals:—

(9.) $\frac{2}{3}$, $\frac{5}{9}$, $\frac{5}{6}$, $\frac{11}{12}$, $\frac{9}{11}$. *Ans.* $\cdot\dot{6}$, $\cdot\dot{5}$, $\cdot8\dot{3}$, $\cdot9\dot{1}\dot{6}$, $\cdot\dot{8}\dot{1}$.

(10.) $\frac{5}{33}$, $\frac{13}{22}$, $\frac{97}{111}$, $\frac{45}{222}$, $\frac{68}{101}$.

(11.) $\frac{54}{909}$, $\frac{76}{123}$, $\frac{173}{271}$, $\frac{245}{365}$, $\frac{281}{813}$.

(12.) $\frac{52}{53}$, $\frac{41}{74}$, $1\frac{107}{180}$, $2\frac{2}{21}$, $4\frac{57}{140}$.

(13.) $\frac{1}{10}+\frac{3}{11}+\frac{7}{8}+\frac{5}{22}+\frac{1}{6}+\frac{1}{33}$, $61\frac{3}{5}+7\frac{4}{11}+8\frac{3}{5}+6\frac{1}{10}$.

(14.) $4\frac{2}{3}\times(5\frac{1}{6}-\frac{7}{12})\times2\frac{3}{5}$, $6\frac{3\frac{1}{2}}{5}\times\frac{1}{18}$, $\frac{105}{211}$.

(15.) $18\frac{3}{7}-2\frac{17}{25}\times(6\frac{5}{7}-4\frac{11}{21})$; $\frac{\frac{4}{5}}{1\frac{2}{5}}+\frac{\frac{6}{7}}{1\frac{1}{5}\times3\frac{1}{6}}\times4\frac{2}{3}$, $8\frac{3}{4}-(4\frac{2}{3}+\frac{7}{9}-1\frac{5}{6})\times\frac{6}{7}$.

RECURRING DECIMALS.

LXXX.

Reduce to vulgar fractions:—

(1.) $\cdot\dot{8}$ (*Ans.* $\frac{8}{9}$); $\cdot6\dot{9}\dot{1}$ (*Ans.* $\frac{137}{198}$); $\cdot42\dot{8}$ (*Ans.* $\frac{123}{280}$.

(2.) $\cdot\dot{7}$, $4\cdot\dot{3}$, $16\cdot1\dot{4}$, $\cdot0\dot{2}$, $\cdot00\dot{1}\dot{3}$.

(3.) $16\cdot00\dot{8}\dot{1}$, $\cdot61\dot{4}$, $6\cdot4\dot{5}$, $16\cdot4\dot{1}\dot{3}$, $2\cdot001\dot{6}$.

(4.) $4\cdot154\dot{5}$, $\cdot12\dot{5}\dot{6}$, $4\cdot408\dot{3}$.

(5.) $1\cdot\dot{9}52380$, $3\cdot22083$, $\cdot092\dot{5}32467\dot{}$.

(6.) $6\cdot59285714$, $3\cdot160\dot{2}56410$, $39\cdot910\dot{7}14285\dot{}$.

LXXXI.

(1.) Find the sum of $6\cdot\dot{5}$, $17\cdot6$, $8\cdot6\dot{1}$, $\cdot01\dot{3}\dot{4}$, $\cdot1\dot{3}2\dot{9}$, correct to 3 decimal places.

6·55555
17·66666
8·61616
·01340
·13291

32·98468

Rejecting the last two figures, the answer is 32·985.

Find correct to 4 decimal places :—

(2.) $6{\cdot}3 + 17{\cdot}4\dot{1} + {\cdot}0\dot{1}3 + {\cdot}63\dot{1}4 + {\cdot}36\dot{1}3$.

(3.) ${\cdot}631\dot{4}\dot{1} + {\cdot}21\dot{8} + 6{\cdot}345\dot{3} + {\cdot}814567\dot{7} + 31{\cdot}6\dot{3}0\dot{1}$.

(4.) $4{\cdot}6\dot{1}4 + 89{\cdot}96\dot{4}2 + {\cdot}0\dot{0}6\dot{1} + 6{\cdot}00\dot{8}3\dot{2} + {\cdot}106\dot{0}3\dot{2}$.

(5.) $3{\cdot}6734\dot{1} + 3{\cdot}6734\dot{1} + 8{\cdot}63\dot{2}1\dot{4} + 19{\cdot}8961\dot{4} + 456{\cdot}\dot{9}6\dot{4}3\dot{2} + 1{\cdot}3\dot{2}14\dot{6}$.

(6.) ${\cdot}4\dot{3}2\dot{4} + {\cdot}674\dot{1}\dot{5} + {\cdot}6\dot{9} + 49{\cdot}\dot{8} + {\cdot}0\dot{0}0\dot{6}7 + {\cdot}000\dot{6}\dot{1}$.

(7.) $89615 + 8961{\cdot}\dot{5} + 896{\cdot}1\dot{5} + 89{\cdot}6\dot{1}\dot{5} + 8{\cdot}9\dot{6}1\dot{5} + {\cdot}\dot{8}9\dot{6}1\dot{5}$.

(8.) $20{\cdot}5\dot{6} + 9{\cdot}4\dot{7}\dot{1} + {\cdot}01\dot{9}\dot{6} + \frac{3}{4} + 16\frac{5}{6} + 2\frac{1}{7}$.

(9.) $\frac{3}{5}$ of $\frac{11}{12} + 6{\cdot}14\dot{5} + 2{\cdot}3\dot{7}\dot{1} + \frac{2}{11}$ of $7\frac{1}{3} + \frac{5}{6}$.

In the sums of the following mark the repeating figures :—

(10.) $4{\cdot}6\dot{3}4\dot{2} + 16{\cdot}39\dot{1}\dot{4} + {\cdot}345\dot{6} + 1{\cdot}00\dot{1}\dot{3} + 6{\cdot}431\dot{2}\dot{4}$.

4·634	234234	2
16·391	414141	4
·345	666666	6
1·001	301301	3
6·431	242424	2
28·803	858767	

The number of figures recurring in the above are 3, 2, 1, 3, and 2, the L. C. M. of which is 6. Extend the repeating figures 1 place more than 6 beyond the longest finite part. Carry from the first column, and mark the circulate as above.

(11.) $6{\cdot}8\dot{4} + 51{\cdot}6\dot{7}\dot{4} + {\cdot}\dot{8} + {\cdot}8\dot{9}\dot{1} + 35{\cdot}6874\dot{1}$. *Ans.* $95{\cdot}9874\dot{1}$.

(12.) $7{\cdot}8\dot{6}74\dot{3} + {\cdot}6\dot{7}45\dot{1} + 32{\cdot}43\dot{1} + {\cdot}3611\dot{3}\dot{4} + {\cdot}0063\dot{1}$.

(13.) $61{\cdot}\dot{8}97671 + 6{\cdot}3\dot{2}1\dot{4} + {\cdot}\dot{8}9\dot{7}6\dot{4} + {\cdot}21\dot{4}\dot{6}\dot{8} + 542{\cdot}\dot{8}961\dot{2}$.

(14.) $3{\cdot}4\dot{6}\dot{1} + {\cdot}06\dot{1} + \frac{2}{7} + 59 + 4\frac{2}{3} + 61\frac{5}{6}$.

(15.) $1{\cdot}1\dot{6}\dot{1} + 116\frac{1}{7} + 1{\cdot}16\dot{1} + 116\frac{5}{6} + 1{\cdot}16\dot{1} + {\cdot}161$.

LXXXII.

(1.) $61{\cdot}3\dot{2}4\dot{1} - 49{\cdot}683\dot{4}\dot{2}$. Correct to 4 places.

61·324124
49·683424
11·6407

Find correct to 4 places :—

(2.) $16\cdot4\dot{5} - 12\cdot3\dot{4}\dot{1}$; $\cdot9\dot{6}\dot{4} - \cdot7\dot{3}2\dot{1}$.

(3.) $1\cdot\dot{6}\dot{1} - \cdot0\dot{1}\dot{3}$; $\cdot00\dot{6}3\dot{4} - \cdot000\dot{3}\dot{1}$.

(4.) $9\cdot\dot{8}\dot{6}\dot{4} - 1\cdot4\dot{3}2\dot{1}$; $\cdot9 - \cdot\dot{2}3\dot{4}5\dot{6}$.

(5.) Find correct to 5 places : $1 - \cdot\dot{9}8\dot{7}6\dot{4}$; $1\cdot64531 - \cdot\dot{8}3\dot{2}1\dot{1}$.

(6.) Find correct to 6 places : $\cdot89\dot{6}4\dot{5} - \cdot89\dot{6}4\dot{5}$.

(7.) Find correct to 4 places : $1 - \cdot0\dot{1} - \cdot00\dot{1}$; $63 - 6\cdot\dot{3} + \cdot\dot{6}\dot{3}$.

(8.) $6\cdot8\dot{9} - 2\cdot74\frac{3}{8}$; $3\cdot761\frac{3}{7} - 1\cdot6\dot{7}\dot{3}$.

In the following mark the repeating figures in the answers :—

(9.) $6\cdot834\dot{1} - 3\cdot4236\dot{1}\dot{4}$.

6·834	141414	1
3·423	614614	6
3·410	526799	

(10.) $9\cdot86\dot{4}\dot{3} - 8\cdot7\dot{3}2\dot{1}$. *Ans.* $1\cdot13\dot{2}21130\dot{}$.

(11.) $1\cdot3\dot{1}0\dot{6} - 1\cdot3\dot{1}0\dot{6}$; $2\cdot4534\dot{1} - 1\cdot4534\dot{1}$.

(12.) $64\cdot5\dot{3}\dot{2} - 19\cdot324567$; $4\cdot3\dot{1}4675 - \cdot467\dot{1}3\dot{2}$.

LXXXIII.

(1.) $\cdot\dot{6} \times \cdot\dot{4} = \frac{2}{3} \times \frac{4}{9} = \frac{8}{27} = \cdot\dot{2}9\dot{6}$.

(2.) $\cdot\dot{3} \times \cdot2$ (*Ans.* $\cdot06$) ; $4\cdot\dot{5} \times \cdot3$ (*Ans.* $1\cdot3\dot{6}$).

(3.) $2\cdot4 \times \cdot06$; $2\cdot4 \times \cdot\dot{0}\dot{6}$.

(4.) $1\cdot\dot{5} \times 3\cdot4$; $1\cdot5 \times 3\cdot\dot{4}$.

(5.) $1\cdot\dot{4} \times 2\cdot\dot{5}$; $3\cdot\dot{7}\dot{1} \times 1\cdot\dot{3}$.

(6.) $\cdot\dot{1} \times 1\cdot\dot{1}$; $1\cdot12\dot{} \times 2\cdot\dot{1}$.

(7.) $\cdot6\dot{9} \times \cdot\dot{7}\dot{5}$; $\cdot04675 \times 2\cdot\dot{4}$.

(8.) $1\cdot364 \times \cdot2\dot{3}$; $1\cdot\dot{0}95238 \times 2\cdot\dot{8}\dot{1}$.

(9.) $6\cdot\dot{3} \div 4\cdot\dot{5}$ (*Ans.* $1\cdot\dot{4}0\dot{7}$) ; $6\cdot3 \div 4\cdot\dot{5}$ (*Ans.* $1\cdot\dot{3}8\dot{2}92\dot{6}$).

(10.) $\cdot\dot{4} \div \cdot\dot{9}$; $\cdot6 \div \cdot0\dot{9}$.

(11.) $\cdot0\dot{6} \div \cdot\dot{9}$; $\cdot06 \div \cdot0\dot{9}$.

(12.) $\cdot\dot{6} \div \cdot\dot{3}$; $1\cdot\dot{3} \div 2\cdot\dot{2}$.

(13.) $2{\cdot}62\dot{6} \div 3{\cdot}08\dot{3}$; $3{\cdot}0\dot{6}9\dot{4} \div 5{\cdot}4\dot{9}$.

Find correct to 5 decimal places :—

(14.) $3{\cdot}04 \div 3{\cdot}0\dot{4}$; $3{\cdot}0\dot{4} \div 3{\cdot}04$.

(15.) $\cdot 857142\dot{8} \div .7$; $\cdot 7857142\dot{8} \div \cdot 6\dot{3}$.

(16.) $\cdot 3\dot{1}8 \div \cdot 43\dot{1}$; $2{\cdot}6\dot{5} \div 1{\cdot}3\dot{2}$.

LXXXIV.

(1.) Simplify : $(\cdot 2345 + \cdot 3655) \times (1{\cdot}897 - 1{\cdot}272) \times (\cdot 3 - \cdot 41 + \cdot 51.)$

(2.) $\dfrac{(\cdot 8\dot{9} - \cdot 4\dot{5}) \div (\cdot 43\dot{2} + \cdot 37\dot{5})}{\cdot 456\dot{3}1\dot{1} - \cdot 092\dot{6}74947}$.

Calculate to 5 places if necessary :—

(3.) $1 + \frac{1}{2} + \dfrac{1}{2.3} + \dfrac{1}{2.3.4} + \dfrac{1}{2.3.4.5}$.

(4.) $\dfrac{1.2}{1.2.3} + \dfrac{1.2.3}{1.2.3.4} + \dfrac{1.2.3.4}{1.2.3.4.5}$.

(5.) $\frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \frac{1}{2^4} + \frac{1}{2^5}$.

(6.) $\frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \frac{1}{3^4} + \frac{1}{3^5}$.

(7.) $\frac{1}{5} - \frac{1}{7} + \frac{1}{5^2} - \frac{1}{7^2} + \frac{1}{5^3} - \frac{1}{7^3}$.

Find the fourth term in the following :—

(8.) $1{\cdot}1 : 2{\cdot}3 :: 14{\cdot}101$.

(9.) $2{\cdot}\dot{3} : 4{\cdot}0\dot{1} :: 13{\cdot}0\dot{2}$ (to 5 places).

NOTE.—The reciprocal of a number is found by dividing unity by that number.

(10.) Find the reciprocal of $3{\cdot}4$, $1{\cdot}3\dot{1}$, $\cdot 43$.

(11.) If $3{\cdot}5$ be $\cdot 16$ of a number, what is the number ?

(12.) If $1{\cdot}0\dot{1}$ be $3{\cdot}69\dot{1}$ of a number, what is the number ? Find correct to 5 places.

(13.) If a man do $\cdot 6$ of a piece of work in a day, in what time could he do the whole work ?

(14.) If a man take $1{\cdot}\dot{3}$ day to do a piece of work, how much will he do in 1 day ?

(15.) What is the average of 31, $3{\cdot}1$, $\cdot 31$, $\cdot 031$, 310 ?

(16.) What is the average of 750, 75, 7·5, 7·5̇, 7·05, 7·05̇, ·705, ·705̇ ?

NOTE.—To find the G. C. M. or L. C. M. of decimal fractions, make the number of decimal places in each the same, then treat them as integers, and mark off the same number of decimal places in the result. In circulating decimals, reduce them first to vulgar fractions, and then find their G. C. M. or L. C. M.

(17.) Find the G. C. M. of 82·5 and 13·75.
The G. C. M. of 8250 and 1375 = 1375.
∴ The G. C. M. of 82·5 and 13·75 = 13·75.

(18.) Find G. C. M. of 4·65 and ·743 ; of 2·04 and 37·2.

(19.) Find L. C. M. of 2, ·4, ·05, and ·8. *Ans.* 4.

(20.) Of ·5, 3, ·04, ·6, and 9.

(21.) Of 7·2, ·12, ·03, ·7, and 4·8.

(22.) Find G. C. M. of ·6̇ and ·4̇ ; of ·9̇3̇ and ·3̇6̇.

(23.) Find L. C. M. of ·6̇ and ·4̇ ; of ·9̇3̇ and ·3̇6̇.

REDUCTION OF DECIMAL FRACTIONS.

MENTAL EXERCISES.

a. To reduce any sum of money to the decimal of £1, correct to 3 places. Half the number of shillings gives the first place ; an odd shilling gives 5 in the second place ; the number of farthings increased by 1 if more than 12, and by 2 if more than 36, complete the second and third places. Thus, 7s. = £·35 ; 2½d. = £·009 ; 7¾d. = £·032, 11⅓d. = £·048 ; 19s. 6¼d. = £·977.

b. To find the value of the decimal of £1, double the first place for the shillings, adding 1 if the second place be 5 or more than 5. The remaining decimals in the second and third places, decreased by 1 if more than 12, and by 2 if more than 37, give the number of farthings—thus, £·374 = 7s. 5¾d., £·897 = 17s. 11¼d.

Reduce to the decimal of £1 :—5d., 7¼d, 1s. 3d., 5s. 3d., 8s. 9½d., 16s. 8d., 17s. 9½d., 19s. 11¾d. &c.

Find the value of £·016, £·009, £·908, £·361, £·876, £·934, &c.

LXXXV.

(1.) Reduce 16s. 4⅔d. to dec. of £1. (*Ans.* £·8197916̇) ; 2s. 6d. to dec. of 6s. (*Ans.* ·416̇).

(2.) 7s. 6½d. to dec. of £5 ; 9s. 3½d. to dec. of 15s.

(3.) 3 lbs. 5 oz. to dec. of ½ stone ; 7 lbs. 6 oz. 3 drs. to dec. of 1 qr., correct to 6 places.

(4.) 3 drs. 1 scr. to dec. of 2 oz. 5 drs. ; 1 gal. 2 qts. to dec. of 3 gals. 1 pt.

(5.) 1 ft. 3 in. to dec. of 2½ yds. ; 1 sq. yd. to dec. of 1 sq. pole.

(6.) ⅓ cu. yd. to dec. of ½ cu. yd. ; 3 days 11 hours to dec. of 1 week 2 days ; 15° 16′ to dec. of 1 right angle.

Find the value of :—

(7.) £·25 (*Ans.* 5s.) ; £·75 ; £·145 ; £6·575.

(8.) £2·4865 ; £3·32$\dot{4}$ (*Ans.* £3, 6s. 5$\frac{3}{4}$d. $\frac{3}{11}$) ; £1·00$\dot{5}$.

(9.) £·52$\dot{3}$; 1·354 of 6s. 8d. (*Ans.* 9s. 0$\frac{1}{4}$d. $\frac{7}{25}$) ; 2·45 of 13s. 4d.

(10.) 25·375 of 3s. 4d. ; ·895 of 15s. ; 3·$\dot{4}$ of £5 (*Ans.* £17, 4s. 5$\frac{1}{2}$d. $\frac{1}{3}$.

(11.) 2·3$\dot{1}$ of £2, 10s. ; 1·45$\dot{6}$ of £3 ; 2·$\dot{4}\dot{5}$ of £1.

(12.) ·234 of 1 cwt. ; ·35 of 1 lb. troy ; 4·45 of a gallon.

(13.) 1·389 of a sq. pole ; ·897 of a degree ; 1·35 of a ton.

(14.) 2·3$\dot{1}$ of 5 drs. apoth. ; ·31$\dot{8}$ of a pole ; ·3$\dot{6}$ of cu. yd.

(15.) 3·45$\dot{9}$ of a year ; ·761 of 2 cwts. 1 qr. ; 1·53 of 1 lb. 4 oz. troy.

(16.) 3·65 of 2 gals. 3 qts. ; ·118 of 3½ sq. yds. ; ·3$\dot{9}$ of 1 cu. yd. 20 cu. ft.

(17.) 1·4$\dot{9}$ of 2 right angles 60° ; 3·8$\dot{1}$ of 16 days 17 hours.

METRIC SYSTEM.

REDUCTION.

LXXXVI.

(1.) Reduce 75 fr. to centimes (*Ans.* 7500 c.) ; 740 fr. to c. (*Ans.* 74000 c.) ; 89 fr. to d.

(2.) $74 to d. ; $16 to c. ; 891 E. to m.

(3.) £42 to fl. ; £19 to c. ; £5 to m.

(4.) 51 m. to millim.; 1 kilom. to m.; 3 myriom. to centim.

(5.) 31 ares to deciar.; 4 dekar. to deciar.; 11 dekar. to centiar.

(6.) 6 st. to decist.; 5 dekast. to decist.; 10 dekast. to st.

(7.) 5 lit. to centil.; 3 kilol. to decil.; 2 myriol. to lit.

(8.) 11 gr. to millig.; 21 hectog. to centig.; 51 myriog. to millig.

(9.) Express as francs and succeeding denominations:—796 centimes (*Ans.* 7 fr. 9 d. 6 c.); 8706 c. (*Ans.* 87 fr. 6 c.); 8320 c. (*Ans.* 83 fr. 2 d.).

(10.) Express as dollars, &c.:—8976 m., 4090 m., 76410 m.

(11.) Express as £s, &c.:—7673 m., 8906 m., 6401 c.

(12.) Express 89761 millim. as metres, &c.; 7642309 millim. as kilom., &c.; 18764321 millim. as myriom., &c.

(13.) 768 centiar. as ares, &c.; 7642 centiar. as dekar., &c.; 4281 deciar. as hectar., &c.

(14.) 876 decist. as steres, &c.; 7493 decist. as dekast., &c.; 4009 decist. as dekast., &c.

(15.) 842 centil. as litres, &c.; 17642 millil. as dekal., &c.; 1897849 millil. as kilol., &c.

(16.) 7649 millig. as grams, &c.; 897642 centig. as hectog., &c.; 7600912 centig. as kilog., &c.

Express in terms of the denominations mentioned only:—

(17.) As francs and centimes, 819 c. (*Ans.* 8 fr. 19 c.); 708 c. (*Ans.* 7 fr. 8c.); 80 6 d.

(18.) As dollars and cents:—896 c.; 764 d.; 7003 d.

(19.) As £ and cents:—896 fl.; 709 fl.; 967 c.

(20.) 896 decim. as m. and millim.; 76 hectom. as kilom. and m.; 73 kilom. as myriom. and m.

(21.) 76 deciar. as a. and centiar; 809 deciar. as hectar; 761 dekar. as ares.

(22.) 42 decist. as st. and centist.; 506 st. as dekast. and decist.; 42 st. as dekast. and decist.

(23.) 81 hectol. as kilol. and lit.; 7906 hectol. as kilol. and lit.; 8496 decil. as lit. and millil.

(24.) 861 hectog. as kilog. and gr.; 764 dekag. as kilog. and gr.; 84 decig. as gr. and millig.

(25.) Express as francs and centimes:—6·2 fr. (*Ans.* 6 fr. 20 c.); 31·09 fr. (*Ans.* 31 fr. 9 c.); ·45 fr. (*Ans.* 45 c.).

(26.) Express as dollars and cents:—$81·4, $960·096, $·614.

(27.) Express as £ and c.:—£7·64; 86·4 fl.; £83·1.

(28.) 6·83 metres as m. and millim.; 71·11 dekam. as m. and decim.; 8·03 kilom. as m. and millim.

(29.) 7·01 ares as ares and deciar.; 61·03 ares as dekar. and deciar.; 7·103 dekar. as ares and centiar.

(30.) 3·03 st. as st. and decist.; 3·3 st. as st. and decist.; 3·3 decist. as steres.

(31.) 1·7 lit. as lit. and centil.; 1·07 lit. as lit. and centil.; 1·007 kilol. as dekal. and lit.

(32.) ·076 kilog. as dekag. and decig.; 1·076 kilog. as hectog. and centig.; 1897·63 gr. as kilog. and dekag.

Express in the denomination mentioned only:—

(33.) 3 fr. 2 c. as fr. (*Ans.* 3·02 fr.); 15 fr. 6 d. as fr. (*Ans.* 15·6 fr.); 51 fr. 7 c. as fr. (*Ans.* 51·07 fr.).

(34.) $3, 5 c. as dol.; $119, 3 m. as dol.; 76 d. 3 c. as dol.

(35.) £3, 2 fl. 5 c. as £.; £6, 6 c. as £.; £3, 25 c. as £.

(36.) 1 kilom. 2 met. as kilom.; 3 kilom. 1 hectom. 5 m. 3 decim. as kilom.; 1 myriom. 3 hectom. 6 decim. 5 centim. as myriom.

(37.) 3 dekar. 1 are 2 deciar. as ares; 1 hectar. 4 ares 8 deciar. as hectar.; 3 hectar. 4 dekar. 7 deciar. as ares.

(38.) 11 st. 8 centist. as dekast.; 3 dekast. 4 decist. as st.; 1 dekast. 1 centist. as st.

(39.) 3 kilol. 3 millil. as lit.; 2 kilol. 1 hectol. 3 dekal. 2 decil. as lit.; 1 myriol. 3 hectol. 16 lit. 3 centil. as kilol.

(40.) 11 kilog. 3 hectog. 5 gr. as dekag.; 1 tonne, 2 quintals 3 kilog. as quintals; 1 quintal 2 kilog. 9 gr. as kilog.

ADDITION.

LXXXVII.

Add together :—

(1.) 1983 fr. 37 c. ; 49 fr. 85 c. ; 6 fr. 8 d. 9 c. ; 4 fr. 60 c. ; 89 fr. *Ans.* 2133 fr. 71 c.

(2.) 683 fr. 40 c. ; 1191 fr. 8 c. ; 6000 fr. 30 c. ; 119 fr 4 d. 3 c. ; 363 fr. 2 c.

(3.) $49,29 c.; $16, 19 c.; $246,15 c.; $540, 54c.; $71, 4 c.

(4.) $39·065 ; $·35 ; ·2 c. ; $52 ; $36, 42·8 c. ; $356·49.

(5.) £9, 4 c. 8 m. ; £4, 5 c. ; £16, 3 fl. ; £49, 5 fl. 2 m. ; £896, 4 c. 9 m.

(6.) £8·432 ; £3·008 ; £·56 ; £1, 5 fl. 3 m. ; 89 c. 7 m.

(7.) 9 met. 8 decim. 5 centim. ; 25 m. 2 decim. 6 centim. ; 30 m. 2 decim. 8 centim. ; 4 m. 3 decim. 4 centim. ; 11 m. 4 decim. 3 centim.

(8.) 25 hectom. 9 dekam. 6 m. ; 36 hectom. 2 dekam. 1 m.; 9 hectom. 4 dekam. 5 m.; 36 hectom. 2 dekam. 7 m.; 3 dek m. 4 m.

(9.) 35 myriom. 6 dekam. 6 centim.; 2 kilom. 3 millim.; 950 m. ; 6 myriom. 42 decim. ; 240 hectom. 36 centim.

(10.) 36 hectar. 2dekar. 5 ares 9 deciar. ; 8 dekar. 4 a. 3 deciar. 6 centiar.; 4 a. 8 deciar. 6 centiar.; 9 dekar. 4 deciar.

(11.) 649 hectar. 14 a. 2500 deciar. ; 36 hectar. 69 centiar ; 634 a. ; 7 hectar 5 dekar 49 deciar.

(12.) 63 dekast. 2 st. 3 decist. ; 8 st. 2 decist. 8 centist. ; 13 dekast. 2 decist. 5 centist. ; 6 st. 4 centist.

(13.) 76 st. 3 decist. ; 28 st. 2 decist.; 194 st. 4 decist.; 16 st. 3 decist.

(14.) 39 lit. 2 decil. 6 centil. ; 674 lit. 8 centil. 6 millil. ; 9 decil. 7 millil.; 20 lit. 4 centil. 6 millil.; 4 decil. 6 centil. 7 millil.

(15.) 83 hectol. 4 lit. 60 centil. ; 742 hectol. 9 lit. ; 432 hectol. 2 centil. ; 21 hectol. 4 lit. 75 centil.

(16.) 36 gr. 6 decig. 2 millig. ; 68 gr. 4 decig. 8 centig. ; 9 decig. 6 centig. 8 millig. ; 891 gr. 7 centig. ; 4 centig. 3 millig. ; 48 gr. 2 centig. 2 millig.

(17.) 96 kilog. 48 gr. ; 7 kilog. 9 decig. ; 490 hectog. ; 6 kilog. 840 gr.

(18.) A person owed 961 fr. 50 c. for furniture, 260 fr. 40 c. for rent, 36 fr. 20 c. for servants' wages, 640 fr. for clothes, and 368 fr. 60 c. of borrowed money. What was the amount of his debts?

(19.) A gentleman divided some money among 5 poor people. To one he gave $1, 5 c., to another $2, 8 c., to another $3, to another $5, 20 c., and to another $2, 50 c. How much did he give away?

(20.) 6 quintals 69½ kilog. + 742¾ kilog. + 11 quintals 4⅝ kilog. + 42 quintals 75¼ kilog. Give the answer in the several denominations.

(21.) 7 hectom. 9 dekam. 6⅘ m. + 8 hectom. 7 dekam. 3⅔ m. + 8 dekam. 2$\frac{7}{10}$ m. + 19 hectom. 8 dekam. 1⅝ m. + 14 hectom. 7 dekam. 5$\frac{2}{15}$ m. Give the answer in the several denominations.

SUBTRACTION.

LXXXVIII.

(1.) 850 fr. 42 c. — 619 fr. 48 c. (*Ans.* 230 fr. 94 c.

(2.) 16 fr. 4 d. 3 c. — 9 fr. 5 d. 7 c.

(3.) $4, 85 c. — $1, 90 c.

(4.) $16·87 — $8·91.

(5.) £81, 45 c. 3 m. — £36, 16 c. 7 m.

(6.) £3, 5 fl. 6 c. — £2, 6 fl. 3 c.

(7.) 25 met. 6 decim. 4 centim. — 16 met. 8 decim. 9 centim.

(8.) 1 kilom. 6 hectom. 2 dekam. — 1 kilom. 5 hectom. 9 dekam.

(9.) 60 dekar. 7 ares 4 deciar.—36 dekar. 9 ares 5 centiar.

(10.) 61 hectar. 4 ares — 5 dekar. 8 ares.

(11.) 9 lit. 9 decil. 8 centil. — 8 lit. 4 decil. 9 centil.

(12.) 41 kilol. 4 hectol. 8 dekal. 4 lit. — 36 kilol. 9 dekal. 6 lit.

(13.) 16 gr. 4 decig. 8 centig. 9 millig. — 1 dekag. 5 gr. 9 decig. 8 millig.

(14.) 891 hectog. 8 gr. 5 centig. 4 millig. — 431 hectog. 6 dekag. 6 gr. 9 decig.

(15.) 69 st. 76 centist. — 5 dekast. 22 decist.

(16.) 23 milliers 305½ kilog. — 19 quintals 219¾ kilog.

(17.) £419, 6 fl. 5½ c. — £219, 7 fl. 6⅝ c.

(18.) 619 fr. 14¾ c. — 540 fr. 16⅝ c.

(19.) A lady went to market with 50 fr. 45 c. in her purse, and bought a pair of gloves for 3 fr. 15 c., 6 metres of calico for 4 fr. 10 c., and paid a bill of 35 fr. 50 c. How much had she left?

(20.) An estate consisted of 250 hectar. 9 ares, of which 149 hectar. 8 ares were arable land, 48 hectar. 9 ares 6 centiar. wooded, and the rest pasture land. How much of it was pasture land?

(21.) Out of a piece of cloth measuring 67 met. 50 centim., a merchant sold 10 met. 25 centim. to one customer, 15 met. 50 centim. to another, and 20 met. 25 centim. to a third. How much had he left?

MULTIPLICATION.

LXXXIX.

(1.) 37 fr. 3 c. × 9, 11, 25. *Answers,* 333 fr. 27 c.; 407 fr. 33 c.; 925 fr. 75 c.

(2.) $169, 15 c. 6 m. × 8, 12, 36.

(3.) £118, 6 fl. 5 c. × 7, 27, 100.

(4.) 27 metres 6 decim. 2 centim. 4 millim. × 9, 45, 19.

(5.) 69 dekar. 3 ares 4 deciar. 6 centiar. × 11, 18, 400.

(6.) 31 dekast. 8 st. 2 decist. × 12, 42, 37.

(7.) 69 lit. 7 decil. 8 centil. 7 millil. × 8, 900, 421.

(8.) 691 gr. 6 decig. 4 millig. × 49, 63, 873.

(9.) 9 quintals 4 myriog. 8⅝ kilog. × 7.

(10.) 18 fr. 45⅜ c. × 9.

(11.) What is the price of 43 metres of cloth at 5 fr. 24 c. per metre?

(12.) If a workman can earn on an average 6 fr. 30 c. daily during a week of 6 days, and spend 4 fr. 50 c., how much will he save in a year of 52 weeks?

DIVISION.

XC.

(1.) 961 fr. 6 d. 7 c. ÷ 8, 12, 32. *Answers,* 120 fr. 2 d. ⅞ c.; 80 fr. 1 d. 3 11/12 c.; 30 fr. 5 7/32 c.

(2.) $190, 90 c. ÷ 9, 11, 48.

(3.) £472, 8 fl. 6 c. 5 m. ÷ 7, 12, 56.

(4.) 9 met. 7 decim. 8 millim. ÷ 18, 100, 70.

(5.) 918 ares 4 deciar. 6 centiar. ÷ 27, 90, 37.

In the following find the quotient and remainder :—

(6.) 94 dekast. 3 decist. 6 centist. ÷ 56, 591, 600.

(7.) 483 lit. 7 decil. 2 centil. 7 millil. ÷ 81, 432, 761.

(8.) 19 hectog. 8 dekag. 9 gr. 4 decig. ÷ 110, 132, 144.

(9.) 7 quintals 4 kilog. 7 hectog. ÷ 1000, 600, 890.

(10.) £169, 5 fl. 6 c. × $8\frac{3}{4}$.

(11.) 116 met. 7 decim. 8 centim. × $11\frac{1}{2}$.

(12.) 16 dekal. 4 lit. 5 decil. ÷ $6\frac{1}{2}$.

(13.) 97 st. 6 decist. 5 centist. ÷ $18\frac{3}{5}$.

(14.) If 8 workmen earn among them £160, 7 fl. in a week of 6 days, what is each man's daily wage?

(15.) Divide $47, 90 c. among 5 men and 5 women, giving a man twice as much as a woman.

(16.) Divide $140, 50 c. among 4 men, 3 women, and 5 boys, giving to each woman twice as much as a boy, and to each man three times as much as a woman.

XCI.

(1.) Find how often 4 fr. 7 d. 3 c. are contained in 14 fr. 1 d. 9 c.

(2.) How often is 8 kilol. 9 hectol. 4 dekal. contained in 3 myriol. 8 kilol. 7 hectol. 4 dekal.?

(3.) Reduce $3 to the vulgar fraction of $3, 7 d. 5 c.

(4.) Reduce 3 ares 36 centiar. to the vulgar fraction of 5 ares 2 deciar. 8 centiar.

(5.) Reduce £3, 4 fl. to the decimal of £5, 2 fl. 9 c. Correct to 5 places.

(6.) Reduce 1 kilom. 13 dekam. to the decimal of 1 myriom. 14 hectom.. Correct to 5 places.

(7.) Reduce $\frac{3}{4}$ fl. to v. f. of £$\frac{3}{7}$; $\frac{5}{8}$ to v. f. of $\frac{9}{7}$ eagle.

(8.) Find the value of $\frac{9}{7}$ fr. ; $\frac{1}{4}$ kilog. ; $\frac{5}{8}$ kilol.

(9.) A wheel is 3 met. 6 decim. in circumference. How often will it turn in running a distance of 60 kilom. 24 dekam. ?

(10.) What is the net weight of 18 casks of butter, each weighing 2 quintals 3 kilog.; tare 1 kilog. 2 hectog. per quintal ?

(11.) 3 met. 4 decim. × 5 met. 6 decim.
2 dekam. 6 met. × 3 dekam. 7 met.
4 hectom. 4 dekam. 7 met. × 3 hectom. 6 met.

(12.) 3 met. 2 decim. × 1 met. 5 decim. × 5 met. 3 decim.; 4 dekam. 6 met. × 5 dekam. 2 met. × 8 dekam. 3 met.; 2 hectom. 6 met. × 8 hectom. 7 dekam. × 9 hectom.

(13.) The width of a railway is 30 met. 6 decim., and the length of it is 56 kilom. How many hectar. of ground does it occupy ?

(14.) Find the capacity of a cube whose edge is 2 decim. 8 centim.

(15.) What is the expense of carpeting a room 9 met. 4 decim. long, 5 met. 8 decim. broad, with carpet 1 met. 2 decim. wide, @ 5 fr. 40 c. per metre ?

(16.) How much water will a cistern contain which is 2 met. 6 decim. long, 1 met. 4 decim. broad, and 1 met. 8 decim. deep ?

(17.) If 30 kilog. of tea cost 150 fr. 30 c., what is the price of 7 kilog. ?

(18.) A gig travelling 6 myriom. in 5 hours starts at 6 A.M. A horseman sent to overtake it travels at the rate of 7 myriom. in 4 hours. When will he overtake the gig if he start at 8 A.M. ?

(19.) If 15 horses and 150 sheep can be kept for 12 days for 350 fr., what sum will keep 12 horses and 90 sheep for 20 days if 6 horses eat as much as 80 sheep ?

(20.) What is the interest on 850 fr. 40 c. for 3 years at $4\frac{1}{2}$ % ? on £60, 4 fl. 7 c. for 6 years at 5 % ? on $980, 25 c. for $4\frac{1}{2}$ years at $3\frac{1}{4}$ % ?

XCII.

Convert to the nearest unit into £, fl., &c. :—

(1.) £17, 18s. 4d. ; £540, 17s. 6d. *Answers*, £17, 9 fl. 1 c. 7 m ; £540, 8 fl. 7 c. 5 m.

(2.) £9, 11s. 5½d. ; £11, 10s. 11¾d.

(3.) £25, 18s. 7d. ; £311, 17s. 6½d.

Convert to the nearest unit into £ s. d. :—

(4.) £16, 7 fl. 8 c. ; £250, 8 fl. 3 c. 4 m. *Answers*, £16, 15s. 7½d. ; £250, 16s. 8½d.

(5.) £16, 5 c. 9 m. ; £25, 8 fl. 8 m.

(6.) £36, 7 fl. 8 c. ; £160, 5 fl. 9 m.

(7.) Convert into francs and cents :—£49, 18s. 4d. (*Ans.* 1258 fr. 90 c.) ; £50, 16s. 7d. ; £49, 17s. 6¾d.

(8.) Convert into £ s. d. :—89 fr. 45 c. (*Ans.* £3, 10s. 11d.) ; 17 fr. 87 c. ; 560 fr. 93 c.

(9.) Convert into $ and cents :—£42, 13s. 4d. (*Ans.* $204, 80 c.) ; £160, 18s. 7½d. ; £456, 11s. 8¾d.

(10.) Convert into £ s. d. :—$67, 47 c. (*Ans.* £14, 1s. 1½d.) ; $150, 67 c. 5 m. ; 6 E. $7, 3 d. 7 c.

(11.) Convert 45·9784 met. into English measure. *Ans.* 50 yds. 10 in.

(12.) 4 miles 1740 yds. into French measure. *Ans.* 8 kilom. 2 dekam. 8 m. 4 decim. 3 centim. 2 millim.

(13.) 11 tons 6 cwt. 3 qrs. 25 lbs. into French weight.

(14.) 4·89764 kilog. into av. weight.

(15.) 4 oz. 7 dwt. 11 gr. into grams.

(16.) 1897·45 grams. into troy weight.

(17.) 3 sq. miles 540 acres into hectares.

(18.) 17 hectar. 8 ares into acres, &c.

(19.) 2 kilol. 6 lit. into gallons, &c.

(20.) 59 gals. 3 qts. into litres.

(21.) 54 c. yd. into c. met. ; 86 c. met. into c. yds.

(22.) If cloth cost 5s. 6d. per yd., what is the price of it per metre in francs ?

(23.) If tea cost 10 fr. 20 c. per kilog., what is that per lb. in English money ?

(24.) Express 6 kilog. 9 hectog. per sq. met. in av. weight per sq. foot.

(25.) Express 5 tons 6 cwt. per cu. yd. in quintals per cu. met.

(26.) Express 25 gr. per sq. centimetre in grains per sq. inch.

PERCENTAGES.

Terms to be explained :—*Per cent.*, *rate per cent.*

XCIII.

(1.) What is 5 % on 240 ? $\frac{5}{100}$ on 240 = $\frac{1}{20}$ of 240 = 12 ?

(2.) What is 8 % on 1760 ? $5\frac{3}{4}$ % on 4600 ? $8\frac{4}{5}$ % on $3674\frac{2}{3}$?

(3.) How much per cent. is 19 out of 95 ? 95 : 100 : : 19 : 20, or $\frac{19}{95}$ of 100 = 20.

(4.) How much per cent. is 17 out of 136 ? 13 out of 78 ? 15 out of 80 ? 21 out of 90 ?

(5.) If $4\frac{1}{2}$ % on a certain number be 90, what is the number ? $4\frac{1}{2}$: 90 : : 100 : 2000, or 90 = $\frac{4\frac{1}{2}}{100}$ of the no., and ∴ the no. = $\frac{100}{4\frac{1}{2}}$ of 90 = 2000 ?

(6.) If 5 % on a number be 27, what is the number ? If $12\frac{1}{2}$ % on a number be 85, what is the number ? If 20 % on a number be 15, what is the number ?

(7.) If 252 equal a certain number increased by 5 % on itself, what is the number ? 105 : 252 : : 100 : 240, or 252 = 1 + $\frac{5}{100}$ of the number ; ∴ the no. = $\frac{20}{21}$ of 252 = 240.

(8.) A number increased by 5 % on itself = 945, what is the number ?

(9.) If 228 equal a certain number decreased by 5 % on itself, what is the number ? 95 : 228 : : 100 : 240, or 228 = 1 − $\frac{1}{20}$ of the number ; ∴ the no. = $\frac{20}{19}$ of 228 = 240.

(10.) A number decreased by 5 % on itself equals 722, what is the number ?

(11.) What is 5 % on 13·113 ? 4·35 % on 189·72 ? 2·56 % on 76·4 ?

(12.) What percentage is 18·65 out of 426·8? 7·4$\dot{1}$ out of 89·5$\dot{4}$?

(13.) If 46·18 be 5 % on a certain number, what is the number?

(14.) If 13·735 be 4·$\dot{3}$ % on a certain number, what is the number?

(15.) A number increased by 5 % on itself = 950, what is the number?

(16.) A number decreased by 4 % on itself = 420, what is the number?

(17.) Express the following percentages as allowances per £:—5, 20, 25, 40, $2\frac{1}{2}$, $6\frac{1}{4}$, $8\frac{1}{3}$.

(18.) Express the following percentages as allowances per shilling:—$12\frac{1}{2}$, 25, 75, $16\frac{2}{3}$, $27\frac{1}{2}$, 30.

(19.) What is 10 % on £640? $8\frac{1}{2}$ % on £1700, 1s. 5d.? $3\frac{1}{2}$ % on £760, 15s.?

(20.) Express the following allowances per £ as percentages:—2s., 10s., 2s. 6d., 3s. 4d., 7s. 6d., 8d., 6d., 9d., 10d.

(21.) Express the following allowances per shilling as percentages:—$1\frac{1}{2}$d., 2d., 3d., 4d., 6d., 8d., $2\frac{1}{2}$d., $3\frac{1}{2}$d.

(22.) What percentage is £30, 10s. out of £508, 6s. 8d.? £800, 5s. out of £14550? £93, 16s. 3d. out of £750, 10s.

(23.) £78, 6s. 3d. equals a certain sum of money plus 5 % on itself. What is the sum?

(24.) A sum of money minus 6 % on itself is equal to £705, 14s. 1d. $\frac{2}{4}$ $\frac{1}{5}$. What is the sum?

(25.) What is 5 % on 960 fr. 40 c.? $6\frac{1}{2}$ % on £840, 6 fl. 8 c.? $3\frac{1}{2}$ % on $760, 18 c.?

(26.) What is ·375 % on £580·75? ·625 % on £420·35?

(27.) The population of a town increased 30·14 % between 1861 and 1871, for 1861 it was 34586. What was the population in 1871?

(28.) The population of a town decreased 15·$\dot{6}$ % between 1861 and 1871. It was 17540 in 1861, what was it in 1871?

(29.) The population of a town in 1871 was 30508, having decreased 20·45 % since 1861. What was it in 1861?

(30.) The population of a town in 1861 was 20600, and in 1871 it was 21430. What was the increase per cent?

(31.) The increase in the population of a town between 1861 and 1871 was 540, which was at the rate of 15·5 per cent. What was the population in 1861?

(32.) A person buys books to the value of £50 according to the ordinary selling price, but a deduction of 25 per cent. being made, what must he pay for them?

(33.) A person has £50 to spend on books, but can buy them at a deduction of 25 per cent. on the selling price. What would be the value of the £50 worth of books at the regular selling price?

(34.) A bought goods to the value of £750, and sold them to B at a loss of 10 % on his outlay. B sold them to C at a gain of 10 % on his outlay. What did C give for them?

(35.) A tradesman uses a lb. weight 1 oz. too light. What is his profit per cent. from this source alone?

COMMISSION—BROKERAGE—INSURANCE.

Terms to be explained :—*Commission; brokerage; insurance, premium, policy; life, fire, and marine insurance; underwriters.*

XCIV.

(1.) Find the commission on £650 @ 3 %; on £890, 17s. 6d. @ 3½ %; on £569, 15s. @ 4¾ %.

(2.) What is the brokerage on £742, 8s. 9½d. @ 3¼ %? on £645, 19s. 2d. @ 5½ %? on £2560, 15s. @ 1s. 6d. per £100?

(3.) A person has property worth £7890, for the insurance of £2500 of which, being considered hazardous, he has to pay 4s. 6d. per £100, and for the rest 1s. 6d. per £100. What has he to pay yearly?

(4.) A gentleman, 25 years of age, insured his life for £1000, the premium being £2, 5s. per cent. He died at the age of 54. What amount of money had he paid for insurance?

(5.) A cargo is valued at £8695, and the expense of insurance is £7, 10s. per cent. What sum must be insured

so that in case of loss both the cargo and the expense of insurance may be covered? and what is the expense of insurance?

INTEREST.

Mental Exercises.

a. To find the interest on any sum at 5 % :—Reckon 1s. for every £, 3d for 5s., 1d. for 1s. 8d., and ½d. for 5d. Thus the interest on £36, 15s. 10d @ 5 % = £1, 16s. 9½d. What is the interest at 5 % on £70, 10s. ; £11, 11s. 8d., &c.

b. To find the interest on any sum for any number of months at 5 % per annum :—Multiply the given sum by the number of months, and reckon 1d. for every £ and ½d. for every 5s. in the result. Thus the interest on £7, 10s. for three months at 5 % = 1s. 10½d. What is the interest on £3, 15s. for 4 months at 5 %? on £250, 10s. for 2 months at 5 %? &c.

c. To find the interest on any sum for any number of years at any rate per cent. :—Multiply the given sum by the number of years and by the rate per cent, after doubling one of them. Reckon the result, with the exception of the last figure, as shillings. The last figure represents so many tenths of a shilling, but in practice may be reckoned as pence. What is the interest on £39 for 3 years at 2 %? $39 \times 3 \times 4 = 468$. The interest $= 46\frac{8}{10}$s. = £2, 6s. 8d., or more accurately = £2, 6s. 9½d. $\frac{2}{5}$. What is the interest on £25 for 7 years at 5 %? on £71 for 3 years at 2 %? &c.

Terms to be explained :—*Interest, time, principal, amount.*

XCV.

Find the interest on :—

(1.) £750, 15s. for 1 year at 3 %. *Ans.* £22, 10s. 5½d. $\frac{3}{5}$.

(2.) £910, 17s. 6d. for 3 years at 4½ %. *Ans.* £122, 19s. 4¼d. $\frac{2}{5}$.

(3.) £713, 18s. 9½d. for 2½ years at 7 %.

(4.) £219, 13s. 8¾d. for 5 years at 3½ %.

(5.) £311, 19s. 8d. for 6¾ years at 5½ %.

(6.) £819, 13s. 4½d. for 7½ years at 3¾ %.

(7.) £642, 17s. 9½d. for 5 years at 4½ %.

(8.) £819, 13s. 8¾d. for 4 years at 6½ %.

NOTE. — In calculating interest, reckon 12 months, or 52 weeks, or 365 days to the year, and 30 days to the month. The day on which money is lent and that on which it is paid are reckoned 1 day. When decimals are used, it is sufficient that they be correct to 3 places. To divide by 73000 (approximately), divide the dividend (neglecting the decimal part) by 3, the quotient by 10, the second quotient by 10; add these quotients and the dividend, and point off 5 places of decimals after subtracting the figures to the left of the first four.

Example.

£986754·61 ÷ 73000

986754·61
328918
32891
3289
135,1852
— 135
13·51717 = £13, 10s. 4d.

Find the interest on :—

(9.) £37, 14s. 5d. for 2 years 5 months @ $3\frac{1}{2}$ %.

(10.) £199, 18s. 7d. for 7 months @ 5 %.

(11.) £897, 14s. $8\frac{1}{2}$d. for 5 years 9 months at $5\frac{1}{2}$ %.

(12.) £1190, 13s. 4d. for 3 years 7 months at $4\frac{1}{4}$ %.

(13.) 500 gs. 13s. 9d. for 7 years 8 months @ 7 %.

(14.) £311, 13s. 5d. for 3 months 15 days @ $2\frac{1}{2}$ %.

(15.) 1000 gs. 14s. 5d. for 3 yrs. 5 mo. 11 days @ $3\frac{1}{4}$ %.

(16.) £749, 16s. 8d. for 79 days @ 5 %.

(17.) £837, 14s. $5\frac{1}{2}$d. for 113 days at 6 %.

(18.) £647, 15s. $9\frac{3}{4}$d. for 236 days @ $5\frac{1}{2}$ %.

(19.) £450, 15s. from 1st Jan. till 19th Feb. @ 5 %.

(20.) £764, 13s. 6d. from 13th March till 24th June @ $2\frac{1}{2}$ %.

(21.) £895, 17s. $9\frac{1}{2}$d. from 15th May till 4th October @ 4 %.

(22.) £645, 16s. 8d. from 31st January till 15th April (leap year) @ 6 %.

(23.) £1150, 15s. 6d. from 14th October till 18th February @ $6\frac{1}{2}$ %.

XCVI.

NOTE.—The answers to the following may be found by the Rule of Three. It must be remembered, however, that the *amount* never enters as one of the terms, except in the case where the *amount* is given to find the *principal*, when for the first term we must find the *amount* of £100 for the given time, and at the given rate.

(1.) What principal will yield £45 of interest in 3 years @ 5 % ? £15 (interest on £100) : £45 : : £100 : : £300, or £45 = 3 times $\frac{5}{100}$ of the principal. ∴ The principal = $\frac{20}{3}$ of £45 = £300.

(2.) What principal will amount to £456 in 4 years @ 5 % ? £120 (amount of £100) : £456 : : £100 : £380, or £456 = (1 + 4 times $\frac{5}{100}$) of the principal. ∴ The principal = $\frac{5}{6}$ of £456 = £380.

NOTE.—The above question may be read as follows :—*What is the present worth of* £456 *due* 4 *years hence at* 5 %? It then becomes a question in discount, and the discount may be found by subtracting the *present worth* or *principal* from the *amount*.

Terms to be explained :—*Discount, present worth, bankers' or mercantile discount, true discount, bill of exchange, promissory note, three days of grace.*

(3.) What sum will yield £8 of interest in 4 years @ $3\frac{1}{2}$ % ?

(4.) What sum will yield £37, 10s. of interest in 2 years 9 months @ $5\frac{1}{4}$ % ?

(5.) What sum will amount to £750, 10s. in 5 years @ 5 % ?

(6.) What sum must be lent that it may amount to £300 in $3\frac{1}{2}$ years @ $2\frac{1}{4}$ % ?

(7.) Find the present worth of £560, 10s. due 2 years hence @ $4\frac{1}{2}$ %.

(8.) Find the present worth of £216, 12s. 6d. due 3 years 9 months hence @ 5 %.

(9.) Find the present worth of £89, 7s. 6d. due 18 months hence @ £1, 15s. per cent.

(10.) Find the true discount on £350, 6s. 8d. due 8 months hence @ 4 %.

(11.) Find the true discount on £275, 13s. 4d. due 1 year 9 months hence @ $3\frac{1}{2}$ %.

(12.) Find the true discount on 800 guineas due 125 days hence @ $4\frac{3}{4}$ %.

(13.) A bill for £450 drawn 3d April for 3 months is discounted 4th May @ $3\frac{1}{2}$ %. How much did the holder receive? Note that this bill was really due on 6th July, and that it was mercantile discount which was deducted.

(14.) A bill for £275, 10s. drawn 5th May for 4 months is discounted 7th June @ 4 %. What was the amount of mercantile discount?

(15.) A bill for £560, 15s. drawn 11th August for 5 months is discounted 5th October @ $3\frac{1}{2}$ %. How much did the mercantile discount exceed the true discount?

(16.) The true discount of a sum of money due 2 years hence @ 5 % is £2, 10s. What is the sum?

(17.) The true discount of a sum of money due 120 days hence at $4\frac{1}{2}$ % is £11, 9s. What is the sum and its present worth?

(18.) At what rate per cent. will £150 amount to £250 in 10 years? *Ans.* $6\frac{2}{3}$.

(19.) The interest on £27, 13s. 4d. for 4 years was £11, 1s. 4d. What was the rate per cent.?

(20.) The interest on £405 for $2\frac{1}{2}$ years was £35, 8s. 9d. What was the rate per cent.?

(21.) At what rate per cent. will a sum of money triple itself in 20 years?

(22.) The true discount of £385, 11s. due 2 years 6 months hence is £35, 1s. At what rate is interest allowed?

(23.) The true discount on £217, 15s. 6d. due 8 months hence is £7, 0s. 6d. At what rate per cent. is interest allowed?

(24.) In what time will £450 amount to £500 at $2\frac{1}{2}$ %?

The interest = £50

$\therefore$ £450 : £100 : : 1 year
$2\frac{1}{2}$ 50

Ans. $4\frac{4}{5}$ years.

(25.) In what time will £842, 10s. amount to £1280, 12s. @ 6½ %?

(26.) In what time will £540, 15s. yield £324, 9s. interest at 5 %?

(27.) In what time will a sum of money double itself at 3 %?

(28.) If the true discount on £6867 10s. at 3¾ % be £167, 10s., how long was the sum paid before it was due?

(29.) If the true discount on £1520, 10s. at 3½ % be £80, 10s., how long was the money paid before it was due?

(30.) What sum must be invested at 4½ % to amount to £504, 9s. in 20 years?

(31.) The interest on a sum of money at the end of 8 years was ⅛ of the sum itself. What was the rate per cent.?

(32.) What is the difference between the discount on £750, 10s. due 3 years hence at 5 %, and the interest on the same sum for the same time at the same rate?

(33.) Find the difference between the amount of £250, 6s. 6d. for 3 years, and the present worth of the same sum due 3 years hence at 6 %.

(34.) Find the difference between the true discount and bankers' discount on £360, 12s. 6d. due 9 months hence at 4½ %.

(35.) A person buys a horse for £150 payable 6 months hence, and sells him the same day for £148. What does he gain by the transaction, calculating interest at 5 %.

(36.) Find the interest due at November 11 on the following transactions at 5 % :—Mr John Anderson borrowed £300 on April 3, paid £200 on June 4, borrowed £100 on July 5, £60 on July 13, and paid £150 on August 11.

(37.) Find the interest due to August 21 on the following transactions at 2½ % :—A. Thomson, Esq., paid into the Commercial Bank £200 January 11, withdrew £150 February 3, paid in £100 February 13, £30 March 5, withdrew £60 March 10, paid in £150 June 3, withdrew

£100 July 12, paid in £300 August 15, and withdrew £150 August 20.

(38.) Find the interest to October 31. 1872 @ 2½ % on the following account of the Bank of Scotland (Dr.) with Mr George Ainslie (Cr.).

Dr.			Cr.		
1871.			1871.		
April 14	. . .	£20	May 5	. . . .	£10
June 3	. . .	£50	July 5	. . . .	£20
July 14	. . .	£100	November 17	.	£50
August 3	. . .	£200			
1872.			1872.		
March 15	. .	£60	April 11	. . .	£60
August 14	. .	£30	October 5	. . .	£50

COMPOUND INTEREST.

Terms to be explained:—*Compound interest, annuity, annuity in perpetuity.*

XCVII.

(1.) Find the compound interest on £450 for 3 years @ 5 %. The interest on £1 for 1 year @ 5 % = £·05, and the amount of £1 for 1 year at 5 % = £1·05.

$$\therefore 1 : 1{\cdot}05 :: 1{\cdot}05 : 1{\cdot}05^2,$$
$$\text{and } 1 : 1{\cdot}05^2 :: 1{\cdot}05 : 1{\cdot}05^3,$$

$\therefore$ £$1{\cdot}05^3$ = amount of £1 for 3 years, and the amount of £450 for 3 years = £$1{\cdot}05^3 \times 450$ = £520·93125. The interest on £450 for 3 years = £520·931 — £450 = £70·931 = £70, 18s. 7½d.

The following is a short way of raising the amount of £1 to the power required:—

$$1{\cdot}05^1 = 1{\cdot}05$$
$$525$$
$$1{\cdot}05^2 = \overline{1{\cdot}1025}$$
$$55125$$
$$1{\cdot}05^3 = \overline{1{\cdot}157625}$$

(2.) Find the compound interest on £700 for 2 years @ 4 %.

(3.) On £560 for 3 years @ 2 %.

(4.) On £890 for 3 years @ 3 %.

(5.) On £1000 for 4 years @ 4 %.

(6.) Find the difference between the simple and the compound interest on £540 for 3 years @ 2 %.

(7.) What sum of money will yield £45 interest in 3 years @ 5 %? Interest on £1 for given time : £45 : : £1 : sum required.

(8.) What sum of money will amount to £850 in 2 years @ 4 %? Amount of £1 for given time : £850 : : £1 : sum required.

(9.) What sum of money will amount to £950, 10s. in 3 years @ 5 %?

(10.) What is the present value of 1000 guineas due 2 years hence @ 6 % compound interest?

(11.) What is the true discount on £560 due 3 years hence @ 3 % compound interest?

(12.) What would an annual rent of £45 amount to in 4 years @ 5 % compound interest? Amount of £1 (annually) $= 1{\cdot}05^3 + 1{\cdot}05^2 + 1{\cdot}05 + 1$. ∴ Amount of £45 (annually) $= £(1{\cdot}05^3 + 1{\cdot}05^2 + 1{\cdot}05 + 1)\ 45$.

(13.) What sum of money paid annually will amount to £250 at the end of 4 years, compound interest, @ 5 %? £250 = annual sum × $(1{\cdot}05^3 + 1{\cdot}05^2 + 1{\cdot}05 + 1)$. ∴ Annual sum = £250 ÷ $(1{\cdot}05^3 + 1{\cdot}05^2 + 1{\cdot}05 + 1)$.

(14.) What is the present value of an annuity of £60 for 3 years @ 4 %? Amount = £60 × $(1{\cdot}04^2 + 1{\cdot}04 + 1)$ = Present value × $1{\cdot}04^3$.

∴ Present value $= \dfrac{£60 \times (1{\cdot}04^2 + 1{\cdot}04 + 1)}{1{\cdot}04^3}$

(15.) What is the present value of an annuity in perpetuity of £400 @ 5 %? £400 ÷ ·05 = £8000.

(16.) What will an annual saving of £20 amount to in 4 years @ 3 %?

(17.) What sum must a person invest annually for 3 years @ 5 % to have saved £500 at the end of that time?

(18.) A person has an annuity in perpetuity of £20, what is the present value of it @ 5 %?

(19.) What is the present value of an annuity of £40 for 4 years @ 4 %?

PROFIT AND LOSS.

Terms to be explained :—*Profit, loss, cost price, prime cost, selling price.*

NOTE.—A gain of 9 per cent. signifies a gain of $\frac{9}{100}$ of cost price ; and a loss of 9 per cent. signifies a loss of $\frac{9}{100}$ of cost price.

XCVIII.

(1.) Tea is bought at 3s. per lb. and sold at 3s. 6d. per lb. What is the gain per cent. ? 3s. : 3s. 6d. : : 100 : $116\frac{2}{3}$ or $\frac{6d.}{3s.} = \frac{1}{6}$ and ∴ gain per cent. $= \frac{1}{6}$ of 100 $= 16\frac{2}{3}$.

(2.) If I buy cloth at 6s. 8d. per yard, at what price must I sell it to gain 5 per cent. ? 100 : 105 : : 6s. 8d. : 7s., or selling price = 6s. 8d. + $\frac{1}{20}$ of 6s. 8d = 7s.

(3.) A piece of furniture was sold for £6, 18s. at a profit of 15 per cent., what was the prime cost ? 115 : 100 : : £$6\frac{9}{10}$: £6, or £$6\frac{9}{10}$ = P. C. + $\frac{15}{100}$ of P. C. ∴ P. C. = $\frac{23}{20}$ of £$6\frac{9}{10}$ = £6.

(4.) If butter which was bought at £3 per cwt. be sold at £4, 5s., what is the gain per cent. ?

(5.) If coffee which cost 1s. 8d. per lb. be sold at 1s. 6d. per lb., what is the loss per cent. ?

(6.) If coffee be bought at 1s. 6d. per lb., and sold at a loss of 5 per cent., what is the selling price ?

(7.) If goods be bought for £15, and sold at a gain of 20 per cent. on the selling price, what was the profit ?

(8.) A house was sold for £400 at a loss of 5 per cent., what would have been gained or lost per cent. by selling it for £480 ?

(9.) By selling sugar at 4d. per lb. a grocer loses 2 per cent. At what price should he sell it per lb. to gain 5 per cent.

(10.) If 8 per cent. be gained by selling a horse for £60, how much per cent. would have been gained or lost by selling it for £50 ?

(11.) A boy buys apples at 3 a penny, and sells at 2 for a penny. What does he gain per cent. ?

(12.) If a person sells 21 articles for the same price as he paid for 27, what does he gain per cent. ?

(13.) A merchant buys 420 lbs. of tea, and sells $\frac{1}{3}$ of it at a gain of 5 per cent., $\frac{1}{7}$ of it at a gain of 8 per cent., and the rest at a gain of 10 per cent. If he had sold it at a uniform gain of 9 per cent. he would have received 2s. more. What was the prime cost per cwt. ?

(14.) A grocer bought 20 hams, weighing on an average 20 lbs. each, at 8d. per lb. He sold $\frac{1}{4}$ of them at 10d. per lb., $\frac{1}{5}$ of the remainder at 1s. per lb. At what price must he sell the rest to gain 20 per cent. on the whole ?

(15.) Of 150 gallons of spirits 30 gallons are lost by leakage, and the remainder is bottled at 6 bottles to the gallon. By selling these as imperial quarts, how much is gained or lost per cent. on the whole ?

(16.) If goods be bought at 16 fr. 40 c. per kilog., and sold at 22 fr. 96 c. per kilog., what is the gain per cent. ?

(17.) If cloth be bought at 10 fr. 8 c. per metre, and sold at a gain of 15 per cent., what is the selling price ?

(18.) If a piece of furniture be sold for $25, 20 c. at a loss of 10 per cent., what was the prime cost ?

PROPORTIONAL PARTS.

XCIX.

(1.) If 11 shares = £220, what are 5, 4, and 2 shares equal to respectively ? If 11 shares = £220, then 1 share = £20. ∴ 5 shares = £100, 4 shares = £80, and 2 shares = £40 ; that is, £220 has been divided into three parts proportional to the numbers 5, 4, and 2.

(2.) Divide £724 into three parts proportional to the numbers 3, 4, and 5.

(3.) If £390 be equal to $\frac{1}{2} + \frac{1}{3} + \frac{1}{4}$ of a sum of money, what is the sum, and what are the half, third, and fourth parts af it ? £390 = $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{6}{12} + \frac{4}{12} + \frac{3}{12} = \frac{13}{12}$ of the sum. ∴ The sum = $\frac{12}{13}$ of £390 = £360., and the required parts are £180, £120, £90 ; that is, £390 has been divided into three parts proportional to $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$.

(4.) Divide £650 among 3 persons so that their shares may be as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{5}$.

(5.) Two houses cost together £4320, and the price of the one to that of the other was as 11 : 7. What was the price of each?

(6.) Divide £35, 18s. 4d. among A, B, and C, so that A's share may be equal to half as much again as B's, and C's to $\frac{1}{4}$ as much again as A's and B's together.

(7.) Divide £735 among A, B, C, and D, so that A's share may be to B's as 2 : 3, B's to C's as 4 : 5, and C's to D's as 6 : 7. Let D's share = 1, then C's = $\frac{6}{7}$, B's = $\frac{4}{5}$ of $\frac{6}{7}$, and C's = $\frac{2}{3}$ of $\frac{4}{5}$ of $\frac{6}{7}$. ∴ £735 is to be divided into four parts proportional to 35, 30, 24 and 16, which are the numerators of the fractions $\frac{35}{35}$, $\frac{30}{35}$, $\frac{24}{35}$, and $\frac{16}{35}$.

(8.) A, B, and C enter into partnership. A invests £200, B £300, and C £550. At the year's end their profits amount to £840, 1s. 9d. What should each receive?

(9.) A invests £250 in a business for 3 months, B £350 for 5 months, and C £450 for 6 months. Their profits amount to £624. What share should each receive?

(10.) A and B invest each £600 in business; at the end of 3 months they admit C as a partner, who invests £500, and 2 months later they admit D, who invests £1000. The profits amounted to £3000, 10s., what should each receive?

(11.) A rents a house at £48 per annum. After 3 months he admits B as a co-tenant, and then after other 6 months they admit C. What should each pay of the rent?

(12.) The juice of sugar cane contains about 18 parts sugar, and 82 parts water. How many lbs. of each are there in 1 ton of this juice?

(13.) If 1 lb. of beef, 1 lb. of mutton, and 1 lb. of lamb together cost 4s. 0½d., what is the price of each, if 6 lbs. of beef cost as much as 5 lbs. of mutton, and 11 lbs. of lamb as much as 12 lbs. of mutton?

(14.) A, B, and C had each a cask of whisky containing respectively 24, 36, and 54 gallons. They blended them, and then refilled their casks. How many gallons of B's whisky were in C's cask?

(15.) Potassium chlorate consists of 35·5 parts of

chlorine, 39·1 parts of potassium, and 48 parts of oxygen. How many lbs. of each are contained in 100 lbs. of the salt?

(16.) Divide to the nearest farthing £259, 15s. into 4 parts, which shall be to each other as 1·3, 2·25, 3·73, and 4·34.

(17.) A invests $750, 50 c. for 4 months, B $800 for 6 months, and C $1000, 40 c. for 12 months. Their profits amount to $1500. How much should each receive?

(18.) If beef be 1s. per lb., and mutton 8d. per lb., what is the ratio of the quantities which at these prices would be equal in value? The prices are as 3 : 2, and the ratio required is the inverse of this, viz., 2 : 3.

(19.) If the loss per lb. on a certain kind of goods be 4d., and the gain on another kind 6d., what is the ratio of the quantities of the two kinds, which could be sold together without loss or gain? The loss to the gain is as 2 : 3, and the ratio required is as 3 : 2.

(20.) How must a grocer mix spirits at 16s., 18s., 23s., and 24s. per gallon respectively so as to sell it at 21s. per gallon?

$$21\text{s.}\begin{cases}16\text{s.} & \dots & \text{gain} = 5\text{s.} & 2\text{ gals.}\\ 18\text{s.} & \dots & \text{gain} = 3\text{s.} & 1\text{ gal.}\\ 23\text{s.} & \dots & \text{loss} = 2\text{s.} & 5\text{ gals.}\\ 24\text{s.} & \dots & \text{loss} = 3\text{s.} & 1\text{ gal.}\end{cases}\quad\text{or}\quad\begin{cases}3\text{ gals.}\\ 2\text{ gals.}\\ 3\text{ gals.}\\ 5\text{ gals.}\end{cases}$$

∴ The quantities are 2 gals., 1 gal., 5 gals., and 1 gal; or 3 gals., 2 gals., 3 gals., and 5 gals.

(21.) How must a grocer mix tea at 2s. 6d., 3s., and 3s. 2d. per lb. to enable him to sell the mixture at 2s. 8d. per lb.?

(22.) Mix tea at 1s. 9d., 2s., 2s. 6d., and 3s. 9d. per lb. so as to sell the mixture at 3s. per lb.

(23.) Mix spirits at 13s. and 15s. per gallon with water so that the mixture may be sold at 12s. per gallon.

(24.) How many lbs. of tea at 2s. per lb. and at 2s. 6d. per lb. must a grocer mix with 30 lbs. at 3s. per lb. that he may sell the mixture at 2s. 9d. per lb.?

(25.) A grocer mixes tea at 2s. 6d., 3s., and 3s. 6d per lb. How many lbs. of each must he mix so that he may have 100 lbs. of the mixture, and be able to sell it at 3s. 4d. per lb.?

(26.) How must tea at 3s. 4d. and 2s. 6d. per lb. be mixed so that it may be sold at 3s. 10d. per lb. at a gain of 20 per cent. on the outlay?

(27.) A grocer buys some tea at 2s. per lb. and some at 3s. 6d. per lb. How must he mix them so that by selling it at 4s. per lb. he may gain 20 per cent. on the cost price of each lb. sold?

(28.) The S. G. of lead is 11·4, of oak ·8, and of cork ·24. What quantity of cork must be added to 80 lbs. of lead that the mass may be of the same weight as an equal bulk of oak?

(29.) If 8 oz. of gold 10 parts fine, 4 oz. 8 parts fine, and 5 oz. of unknown fineness be mixed, and the mixture be 12 parts fine, what is the unknown fineness?

(30.) If £50 be due in 4 months, £60 in 3 months, £90 in 6 months, and £20 in 9 months, at what time may these sums be paid together?

$$\begin{array}{rr} 50 \times 4 = & 200 \\ 60 \times 3 = & 180 \\ 90 \times 6 = & 540 \\ 20 \times 9 = & 180 \\ \hline 220 & 1100 \end{array} \qquad \therefore \frac{1100}{220} = 5 \text{ months.}$$

(31.) £20 is due in 61 days, £50 in 40 days, and £70 in 30 days. When may they be paid together?

(32.) £100 is due in 2 months, £80 in 3 months, and £60 in 6 months. Find the equated time of payment.

(33.) A owes £500 payable in 8 months. He however pays £200 in 3 months, and £100 in 6 months. When is the remainder due?

STOCKS.

Terms to be explained :—*Stocks, dividend, at par, at a discount, at a premium, brokerage.*

NOTE.—Unless otherwise stated, it is to be understood that in the following questions brokerage, or ¼ on every £100 stock bought or sold, is to be taken into account.

C.

(1.) How much stock in the 3 per cent. Consols at 92⅜ may be purchased with £1000? £92½ : £1000 : : £100 : stock required.

(2.) How much stock may be purchased with £960 in the 5 per cents. at 100⅝?

(3.) How much stock may be purchased in the 3½ per cents. with £1800, at 95¼?

(4.) How much must be given for £1100 stock in the 2½ per cents. at 94½? £100 : £1100 : : £94⅝ : price required.

(5.) How much must be given for £850 stock in the 3 per cents. at 96¼?

(6.) How much must be given for £600, 10s. stock in the 3½ per cents. at 89½?

(7.) How much will be received for £850 stock in the 2½ per cents. at 86½? For every £100 stock, £86½ — ⅛ (brokerage) will be received. ∴ £100 : £850 : : £86⅜ : sum required.

(8.) How much will be received for £960, 15s. stock when the price is quoted at 96⅜?

(9.) What amount of stock at 90⅜ must be sold to realise £6362, 12s. 6d.? 90½ : £6362, 12s. 6d. : : £100 : stock required.

(10.) What amount of stock must be sold to realise £3438, 7s. 6d. when the price is 86⅝?

(11.) What income is derived from £1150 stock in the 3 per cents.?

(12.) A person invested £3000 in the 5 per cents. at 96¾. What is his yearly income? £96½ give £5. ∴ £96½ : £3000 : : £5 : income required.

(13.) What income is derived from investing £2500 in the 3 per cents. at 83¾?

(14.) What rate per cent. is received on money invested in the 4 per cents. at 90⅜? £90½ : £100 : : £4 : rate per cent. required.

(15.) What rate per cent. is received on money invested in the $2\frac{1}{2}$ per cents. at $96\frac{1}{4}$?

(16.) At what price must 3 per cent. stock be purchased to get 5 % for the money? £5 : £3 : : £100 : price required.

(17.) How much money must a person invest in the 3 per cents. at $96\frac{1}{4}$ to get an annual income of £500?

(18.) A person buys £2500 stock at $98\frac{1}{2}$, and sells out at $96\frac{3}{4}$. What is his loss?

(19.) A gentleman transfers £1500 stock from the 3 per cents. at $90\frac{1}{2}$ to the 4 per cents. at $95\frac{3}{8}$. How much of the latter stock will he hold?

(20.) A person transfers £3500 stock from the $2\frac{1}{2}$ per cents. at $98\frac{3}{4}$ to the 3 per cents. at $98\frac{5}{8}$. What will be the difference in his income?

(21.) Whether is it better to invest in the $2\frac{1}{2}$ per cents. at $90\frac{1}{2}$, or in the 3 per cents. at 95?

CHAIN RULE AND EXCHANGE.

Terms to be explained :—*Exchange, par of exchange, course of exchange, arbitration of exchange, bill of exchange, specie, bullion, short exchange.*

CI.

(1.) If 16 lbs. of ham are equal in value to 12 lbs. of butter, 7 lbs. of butter to 14 lbs. of sugar, 8 lbs. of sugar to 4 lbs. of coffee, to how many lbs. of ham are 6 lbs. of coffee equal? 1 lb. of coffee $= \frac{8}{4}$ lb. of sugar $= \frac{8}{4}$ of $\frac{7}{14}$ lb. of butter $= \frac{8}{4}$ of $\frac{7}{14}$ of $\frac{16}{12}$ lb. of ham. $\therefore$ 6 lbs. of coffee $= 6$ ($\frac{8}{4}$ of $\frac{7}{14}$ of $\frac{16}{12}$) lbs. of ham $= 8$ lbs. of ham ; or by chain rule :—

x lbs. of ham = 6 lbs. of coffee
4 lbs of coffee = 8 lbs. of sugar
14 lbs. of sugar = 7 lbs. of butter
12 lbs. of butter = 16 lbs. of ham

and $\frac{6 \times 8 \times 7 \times 16}{4 \times 14 \times 12} = 8$

(2.) If £5 equal 126 francs, 63 francs equal 13 American dollars, 5 dollars equal 9 Austrian florins, how many florins are equal to £25?

(3.) If £3 be equal 19 Russian roubles, 1 rouble to 100 copecks, 64 copecks to 11 Turkish piasters, how many piasters are equal to £48?

(4.) A merchant in Paris owes 560·4 fr. to a merchant in London, to how much sterling money is this equal when exchange is at 25·3 fr. per £1?

(5.) A merchant remits £900 from London to Berlin, at the rate of £1 to 6 thalers 25 groschen. To how many thalers is this sum equivalent? 30 *silber groschen* = 1 *thaler.*

(6.) What is the arbitrated rate of exchange between France and England when £650 pay a debt of 16575 francs?

(7.) Find the arbitrated rate of exchange between London and Paris, when between London and Amsterdam 12 florins 3 stivers = £1, and between Amsterdam and Paris 210 fr. = 100 florins. 20 *stivers* = 1 *florin, and* 5 *cents.* = 1 *stiver.*

(8.) If 100 American dollars equal £22, 10s. at par, what is the value of the dollar when the rate of exchange at New York is at 8% premium? 108 : 1 : : £22, 10s. : 4s. 2d.

(9.) If 100 American dollars equal £22, 10s. at par, how much sterling money is equal to $115·5 at 9% premium?

(10.) How many dollars will be received for £560 at 9½ % premium?

(11.) If £1 be given in London for 25·65 fr., but in Paris only 25·5 fr. are given for £1, how much per cent. is gold dearer in London than in Paris? 25·65 : 100 : : ·15 : rate per cent. required.

(12.) When 12 florins 5 stivers are given for £1 in Amsterdam, and £1 for 12 florins 2 stivers in London, how much % dearer is gold in Amsterdam than in London?

(13.) The exchange of London on Paris is 25·3 francs at 3 months. What is the short exchange at 5% per annum?

ROOTS.

CII.

Find the square root of :—

(1.) 6241 (*Ans.* 79) ; 2209 (*Ans.* 47) ; 9409 (*Ans.* 97).

(2.) 44944 (*Ans.* 212) ; 116281, 273529, 492804.

(3.) 485809, 51710481, 69006249, 81558961.

(4.) 6132769344, 4858229401, 170742·5041, 709081·8849.

(5.) 100·620961, 1·88210961, 8·77225924, ·0127712601.

(6.) Find the fourth root of :—28561, ·00279841.

(7.) Find the eighth root of :—5764801, ·00006561.

(8.) Extract to 6 places of decimals :—$\sqrt{3·5}$, $\sqrt{·0111}$, $\sqrt{·0011}$, $\sqrt{·7}$, $\sqrt{·07}$.

Find the cube root of :—

(9.) 6859 (*Ans.* 19) ; 12167 (*Ans.* 23) ; 4913 (*Ans.* 17).

(10.) 32768, 24389, 493039, 1601613.

(11.) 2299968, 1442897, 1157625, 6751269.

(12.) 8120601, 8365427, 54439939, 51064811.

(13.) 53157·376, 1338·273208, 13498272·341, 2·605285376.

(14.) Find the sixth root of :—117649, 531441.

(15.) Find the ninth root of :—19683, 2·357947691.

(16.) Extract to 6 places of decimals :—$\sqrt[3]{1·3}$, $\sqrt[3]{·2}$, $\sqrt[3]{·0011}$, $\sqrt[3]{5}$.

(17.) $\sqrt{13\frac{4}{9}}$, $\sqrt{\frac{5}{6}}$, $\sqrt{\frac{9}{11}}$.

(18.) $\sqrt[3]{101\frac{17}{27}}$, $\sqrt[3]{\frac{2}{3}}$, $\sqrt[3]{\frac{7}{9}}$.

MENSURATION.

CIRCLE : Circumference = D × 3·1416 ; diameter = C ÷ 3·1416 ; area = radius^2 × 3·1416 ; R = $\sqrt{}$(area ÷ 3·1416).

SQUARE : Area = side^2, or = diagonal^2 ÷ 2 ; side = $\sqrt{}$area ; diagonal = $\sqrt{}$ (2 area.)

RECTANGLE : Area = length × breadth.

PARALLELOGRAM : Area = base × perpendicular height.

TRIANGLE: Area $= \frac{\text{base} \times \text{p. h.}}{2}$, or from half the sum of the three sides subtract each side separately. Multiply the half sum and the three remainders together, and take the square root of the product.

SPHERE: Area $= D^2 \times 3{\cdot}1416$; solid contents $= D^3 \times {\cdot}5236$;
$D = \sqrt{(\text{area} \div 3{\cdot}1416)}$, or $= \sqrt[3]{(\text{solidity} \div {\cdot}5236)}$.

CUBE: Solidity $= \text{side}^3$. Side $= \sqrt[3]{\text{solidity}}$.

PARALLELOPIPED: Solidity = area of the base × p. h.

CIII.

(1.) The area of a circular green is 1661·9064 sq. yds., what is the length of its diameter?

(2.) How many square yards are there in a circular croquet green which measures 50 yards across?

(3.) How many acres are there in a square piece of ground of which the diagonal measures 8 chains?

(4.) A square field consists of 4 ac. 3 ro. 24 po., what is the length of its side in chains?

(5.) A rectangular piece of ground measures 19 chains in length and 5 in breadth. How many acres does it contain?

(6.) The sides of a triangular field measure respectively 5, 8, and 11 chains. How many acres does it contain, correct to 3 decimal places?

(7.) What is the surface of a glass globe of which the diameter is $1\frac{1}{2}$ feet?

(8.) The solidity of a ball is 960 cubic inches. What is the length of its diameter (correct to 2 places of dec.)?

(9.) What is the solidity of a globe 9 inches in diameter?

(10.) What is the length of the edge of a cube of which the solidity is $\frac{1}{8}$ cubic inch?

(11.) What is the difference in area between a square whose side measures 625 ft., and a circle of which the diameter is the same length?

(12.) What is the difference in superficial measurement between a sphere whose diameter is 25 ft., and a cube whose edge also measures 25 ft.?

(13.) What is the difference in solidity in the last example?

(14.) Find the diameter of a sphere of which the circumference is 630 feet?

(15.) Find the diameter of a sphere of which the superficial measurement is 630 sq. ft.?

(16.) Find the diameter of a sphere of which the solidity is 630 cubic feet?

(17.) What is the difference in the length of the side of a square which contains 16 sq. ft., and the edge of a cube of which the solidity is 16 cubic feet?

MISCELLANEOUS EXERCISES.

CIV.

(1.) $\cdot 67413 + \cdot 674\dot{1}\dot{3} + \cdot 67\dot{4}1\dot{3} + \cdot 6\dot{7}413 + \cdot\dot{6}7413 + 6\cdot 7413$. Find correct to 5 places.

(2.) Find the value of $\cdot 964 - \cdot 132 + 9\cdot 64 - 1\cdot 32 + 96\cdot 4 - 13\cdot 2 + 964 - 132$.

(3.) Compound the following ratios:—1 : 2, 2 : 3, and 3 : 4.

(4.) A clock gains $4\frac{1}{3}$ minutes daily. How should its hands be placed at noon that it may give the true time at 8 o'clock next morning?

(5.) $(\cdot 061 - \cdot 0539) \times \cdot 69$.

(6.) Find correct to seven places $\cdot 01968^3$.

(7.) If 6 gallons of brandy be worth 8 gallons of rum, and 8 gallons of rum be worth 9 gallons of whisky, what is the price of a gallon of each when 3 gallons (one of each) cost 58s.?

(8.) $(1\cdot 1)^8 \div (1\cdot 1)^4$.

(9.) $\dfrac{(8\cdot 14)^2 - (2\cdot 49)^2}{8\cdot 14 - 2\cdot 49}$.

(10.) The profit on certain sales is 40 %, and an agent receives 10 % of the profits, what percentage of the whole sales does he receive?

(11.) If by selling at 15s. I lose $\frac{1}{3}$ as much as I receive, at what price must I sell to gain 15 % on the outlay?

(12.) $25\cdot 61 \div \cdot 496832$. Find correct to 6 places.

(13.) Find the G. C. M. of £8, 15s. 6d. and £9, 8s. 6d.; also their L. C. M.

(14.) In how many months will £100 amount to £110 at 6 %?

(15.) $2{\cdot}31^3 - 1{\cdot}45^3$.

(16.) $\dfrac{1{\cdot}02 \times 10{\cdot}2}{{\cdot}102 \times 102}$.

(17.) $\dfrac{{\cdot}96458 - {\cdot}16458}{{\cdot}341 + 1{\cdot}159} \times \dfrac{{\cdot}4084 + {\cdot}3416}{8{\cdot}973 - 7{\cdot}373} \times \dfrac{{\cdot}241 + {\cdot}147 + {\cdot}112}{3{\cdot}457 - {\cdot}389 - {\cdot}818}$.

(18.) George runs at the rate of 7 miles an hour, and Henry at the rate of 6 miles an hour. How long will George take to overtake Henry if the latter have a start of 100 yards?

(19.) A is to B as 3 : 4, B to C as 5 : 6, and C to D as 7 : 8. Find the continued ratio of A, B, C, and D.

(20.) One vessel contains 9 gallons of spirits and 4 gallons of water, and another 7 gallons of spirits and 3 of water. Compare the strength of the one to the other.

(21.) Find the reciprocal of 17·16 to 5 places.

(22.) What multiplier will convert tons per cubic yard into ounces per cubic inch? Find correct to 5 places of decimals.

(23.) For every shilling B gains A gains 8d., and for every shilling B gains C gains 1s. 6d. Compare the gains of A and C.

(24.) A and B can finish a piece of work in 3 days, A and C in 4 days, and B and C in 6 days. If 12s. be paid for the work, what should each man receive per day when all work together?

(25.) A, B, and C rent a house for 2 years at £120 per annum. A remains the whole time, B remains 8 months, and C $2\frac{2}{3}$ months while B is there. How much should each pay of the rent?

(26.) Divide 60 into two such parts that 16 times the one and 19 times the other will together equal 1005.

(27.) A tug, 70 feet long, going at the rate of ten miles an hour, tows a ship 560 feet long by a rope 400 feet long. A vessel 230 feet long sails in the same direction at the rate of 12 miles an hour. When will she pass the tug entirely from the time when she first came up with the ship?

(28.) A brigade consists of 3 regiments. A 1000 strong, with 20 % sick; B 1500 strong, with 15 % sick; and C 500 strong, with 25 % sick. What is the percentage of sickness in the brigade?

(29.) If the strength of 3 regiments be as 3, 4, and 5, having respectively 20, 10, and 15 % sick, what is the percentage of sickness in the brigade?

(30.) The true discount on £637, 10s. due 3 months hence is £12, 10s. What is the rate per cent.?

(31.) A person rows from A to B a distance of $1\frac{1}{2}$ miles, and back again in $1\frac{1}{2}$ hours. What time would he have taken supposing the stream had flowed from B to A at the rate of $1\frac{1}{2}$ miles an hour for the first half hour, and then ceased?

(32.) If India 5 per cents. be selling at $110\frac{5}{8}$, what sum must I invest to get an income of £580, 3s. 4d., after paying 4d. per £ of income tax? B $\frac{1}{3}$.

(33.) The sum of the ages of A and B is 80, and 15 years ago they were as 3 : 2. What are their ages now?

(34.) If 3 % more be gained by selling a house for £719, 10s. than by selling it for £700, what was its original price?

(35.) If the interest on £370, 10s. for a certain time at 5 % be equal to the discount on £376, 13s. 6d. for the same time at the same rate, when is the latter sum due?

(36.) A ship whose speed is 10 miles an hour started at 12 o'clock to go a distance of 80 miles. Another whose rate of sailing was as 4 : 3 to that of the first, started from the same place, and arrived 10 minutes before the other. When did the second vessel start?

(37.) If I gain 40 per cent. by selling at 10 fr. 50 c., what shall I gain or lose per cent. by selling at 6 fr. 40 c.?

7 hectom. 5 dekam. 5 m. × 8 dekam. 9 m. × 7 8 m. 6 decim.

(39.) If $2\cdot1\dot{3}$ be $1\cdot\dot{2}$ of 6·3 of a number, what is the number?

(40.) Find the G. C. M. of 874·8 and 36·45.

(41.) Find the L. C. M. of ·3, 1·7, ·9, 5·1, and ·34.

(42.) A cask contains 4250 ounces of water. What weight of olive oil, of which the specific gravity is ·908, would be required to fill it?

(43.) Simplify $\frac{272160}{408240} \times \frac{1679328}{3358656} \times \frac{2592}{4320}$.

(44.) Three men set out to walk round an island 67 miles in circumference; A at the rate of 10 miles, B 12 miles, and C 16 miles a-day. For how many days must they continue walking till they be all together again as at first starting?

(45.) If 3 men assisted by 2 boys can build 33 yards of wall in 10 days, or 5 men assisted by 3 boys can build 54 yards in the same time, in what time will 6 men assisted by 5 boys build 276 yds?

(46.) An elastic ball rises $\frac{4}{5}$ of the height from which it fell after each rebound. After how many rebounds will the height to which it rises be less than $\frac{1}{4}$ of the height from which it fell at first?

(47.) A can do a piece of work in 12 hours, A and C together in 9 hours, and A's work is $\frac{3}{4}$ of B's. A begins at 4 o'clock. At what hour should B and C begin in order that the work may be finished by 12 o'clock?

(48.) If 4 men and 9 women can do 6 times as much work as 1 man and 1 woman, what is the ratio of a man's work to that of a woman?

(49.) A boat which sails 5 miles an hour sailed from A to B, a distance of 35 miles, and another which left half an hour later arrived a quarter of an hour after the other. Compare their rates of sailing.

(50.) Sound travels at the rate of 1125 feet per second. If a shot be fired from a ship moving at the rate of $15\frac{5}{8}$ miles an hour, $16\frac{1}{8}$ miles distant, how many yards will the ship have moved before the report is heard on the shore?

(51.) Two ships pass a certain port, the one 5 hours after the other, sailing respectively at the rate of 10 and

12 miles an hour. How far will the first have sailed past the port before it is overtaken by the other?

(52.) A certain sum of money lent at simple interest amounted in 9 months to £466, 17s. 6d., and in 6 months more to £478, 2s. 6d. What was the sum and the rate per cent.?

(53.) An American dollar is worth 4s. $3\frac{3}{4}$d., or $5\frac{21}{50}$ francs. What is the smallest sum that can be paid in crowns, dollars, or francs?

(54.) A dishonest merchant uses a weight $1\frac{1}{6}$ oz. too light for 1 lb., and professes to sell at cost price. What does he gain per cent.?

(55.) At what times between 5 and 6 o'clock are there 17 minute spaces between the hour and minute hands of a watch?

(56.) Two men ran a race. The first took 300 steps a minute, and the second 304, but 15 of the former were equal to 16 of the latter. The former ran the course of 2 miles in 12 minutes. By how many yards was the race won?

(57.) Charles distributed some nuts among his companions. He gave half of the number and 2 more to John, $\frac{1}{5}$ of the remainder and 1 more to James, $\frac{1}{3}$ of the remainder and 1 more to Robert, and then he had 17 left. How many had he at first?

(58.) If 8 men and 10 women earn £17 in 20 days, or 3 men and 4 women earn £9, 15s. in 30 days, in what time will 11 men and 12 women earn £80?

(59.) If the price of note paper 9 inches long be 3d. per quire, or of the same breadth and quality $10\frac{1}{2}$ inches long be 4d. per quire, which is the cheaper, and what is the saving per cent. by purchasing the one rather than the other?

(60.) A clock which was $1\cdot\dot{5}$ minutes too fast at 20 minutes to 10 P.M. April 5, was 10 minutes too slow at 3 A.M. April 13. When was it exactly correct?

(61.) If the difference between the incomes derived from investing a sum in the $2\frac{1}{2}$ per cents. at 75 and in the India 5 per cents. at 112 be £57, what was the sum invested?

(62.) John can beat James by 6 yards in a 100 yards' race, and James can beat Andrew by 12 yards in a 200 yards' race. By how many yards can John beat Andrew in a 500 yards' race?

(63.) By what number less than 1000 must 6983 be multiplied so that the last 3 figures of the product may be 999?

(64.) Find the square root of 990·738576.

(65.) A grocer mixed wine at 30s. a gallon, and brandy at 44s. a gallon, and found that by selling at 38s. a gallon he gained 14 % on the price of the wine, and 15 % on the price of the brandy. In what ratio did he mix them?

(66.) Mix spirits at $3, 20 c.; $4, 25 c.; and $6, 30 c. to sell at $5 per gallon.

(67.) At what rate per cent. will a sum of money double itself in $6\frac{1}{4}$ years?

(68.) The rate of a clock is ·275 % too fast. How much will it gain in a day?

(69.) $$\frac{(8\cdot\dot{3}\dot{7} - 7\cdot7\dot{1}) \times (2 - 1\cdot\dot{8}5714\dot{2})}{(\cdot346\dot{4}1\dot{3} + \cdot939300\dot{8}7\dot{2}) \div (\cdot8\dot{8}\dot{9} - \cdot1\dot{3}9\dot{8})}.$$

(70.) Find the expense of papering the walls of a room 6 metres 4 decim. long, 5 m. 3 decim. wide, and 5 m. 6 decim. high, with paper 9 decim. wide, at 1 fr. 25 c. per metre.

(71.) Express 540 grs. troy per cu. in. in lbs. avoirdupois per cu. ft.

(72.) Find the cube root of 102·503232.

(73.) In what proportion must gold at £4·25 per ounce and silver at 5·5 sh. per ounce be mixed with an alloy of no comparative value that the mixture may be worth £3.45 per oz.?

(74.) A and B enter into partnership, their capital being as 2 : 3. At the end of 4 months A withdraws $\frac{1}{6}$ of his capital, and 3 months later B puts in one half as much as he did before. Their profits amount at the year's end to £636. How should they be divided?

(75.) A stationer sold pencils at 9s. per 100, clearing $\frac{1}{5}$ of the money. What would he have cleared per cent. by selling at 10s. 6d. per 100?

(76.) In what time will a sum of money quadruple itself at 8 %?

(77.) What is the true discount on £850 due 4 years hence at 5 %, compound interest?

(78.) In a quantity of metal $\frac{11}{12}$ by weight consists of an alloy containing $\frac{6}{13}$ of tin, while the remainder consists of $\frac{1}{8}$ copper and $\frac{7}{8}$ silver. The silver weighs $3\frac{1}{2}$ lbs. troy. What is the weight of the tin in lbs. avoirdupois?

(79.) Two boats start to row a race over a course 1 m. 850 yds. in length. The rate of the one is 10 miles an hour, and of the other $9\frac{1}{2}$ miles an hour. If sound travels 1125 ft. per second, how far ahead will the faster boat be when the report of the gun fired at starting is heard at the winning post?

(80.) A metal contains 8 parts of brass and 1 of tin. 6 lbs of tin are added, and then there is 7 times as much brass as tin. How many lbs. of brass are there in the metal?

(81.) A metal consists of three parts of brass and 4 of tin. How much of the metal must be taken away and replaced by brass that it may consist of an equal quantity of each?

(82.) If a man can row 12 miles in three hours against a stream which flows at the rate of 4 miles an hour, in what time will he row 6 miles with it?

(83.) A hare starts 60 yards before a hound, and runs during 45 seconds before she is seen. She runs 10 miles an hour and the hound 15. How long will the chase last, and how far will the hound have run?

(84.) The weight of water is 1000 oz. av. per cu. ft. A first-rate man of war is effectively about 160 ft. long by 40 ft. broad. How many tons are required to sink it an additional foot?

(85.) If the work of a man, woman, and boy be as 8, 6, and 4, and if 4 men, 3 women, and 6 boys finish a

piece of work in 15 days of 8 hours each, in what time will 6 men, 2 women, and 1 boy do it?

(86.) Two clocks are together at 11 o'clock A.M. on a certain day, but the one loses 5″ and the other gains 3″ every 12 hours. After what interval will the one have gained 45 minutes on the other? and what time will each then shew?

(87.) A certain sum of money is to be earned by selling a certain number of nuts. If at 60 a penny I shall have 9d. too little, and if at 50 a penny 1s. too much. How many nuts have I to sell?

(88.) A hare is 64 leaps before a greyhound, and takes 5 leaps for the greyhound's 4, but 3 leaps of the hound are equal to 4 of the hare's. How many leaps must the hound take to catch the hare?

(89.) A railway train 100 yards long overtook a horseman riding at the rate of 6 miles an hour, and passed him in 15 seconds; it afterwards overtook a person walking, and passed him in 12 seconds. At what rate was the person walking?

(90.) A merchant sells an article so as to gain $12\frac{1}{2}$ %. If he had paid $12\frac{1}{2}$ % less for it, and sold it for 2s. 6d. less, he would have gained 25 %. What did he pay for it?

(91.) A person owns £6000 India 4 per cents. He sells and invests in the $2\frac{1}{2}$ per cents. at 75. If the increase in his income be £10, what was the price of the 4 per cents.?

(92.) If a box made of oak weigh 200 lbs., what would it weigh if it had been made of iron, the specific gravities of oak and iron being ·925 and 7·788?

(93.) A bottle contains 3500 grains of water, or 3276 grains of lintseed oil. What is the specific gravity of the oil?

ARITHMETICAL TABLES.

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WEIGHT.

(*I.*) *AVOIRDUPOIS WEIGHT—For all Common Goods.*

16 drams (drs.) = 1 ounce (oz.).
16 ounces . = 1 pound (lb.).
28 pounds . = 1 quarter (qr.).
4 quarters . = 1 hundred-weight (cwt.).
20 hundred-weights = 1 ton.

14 lbs. . = 1 stone.
112 lbs. = 1 cwt.

437½ grains = 1 ounce.
7000 grains = 1 lb.

TABLE OF ALIQUOT PARTS.

OF 1 TON.	OF 1 CWT.	OF 1 QR.	OF 1 LB.
10 cwt. . = ½.	2 qr. = ½.	14 lb. = ½.	8 oz. = ½.
5 ,, . = ¼.	1 ,, = ¼.	7 ,, = ¼.	4 ,, = ¼.
4 ,, . = ⅕.	16 lb. = ⅐.	4 ,, = ⅐.	2 ,, = ⅛.
2 ,, 2 qrs. = ⅛.	14 ,, = ⅛.	3½ ,, = ⅛.	
2 ,, . = 1/10			

(*II.*) *TROY WEIGHT—For Gold, Silver, Jewels, &c.*

24 grains . = 1 penny-weight (dwt.).
20 penny-weights = 1 ounce (oz.).
12 ounces . = 1 pound (lb.).

480 grains = 1 ounce.

5760 grains = 1 lb.

Carat of diamond = 3⅓ grs.
Carat of gold or silver = 240 grs.
Standard gold is 22 carats fine, *i. e.* 22 parts out of 24.
Jewellers' gold is 18 carats fine.
1 lb. of Sterling silver contains 18 dwt. of alloy, and 11 oz. 2 dwt. of pure silver.

(*III.*) *APOTHECARIES' WEIGHT—For Medical Prescriptions.*

20 grains (grs. xx) = 1 scruple (℈j).
3 scruples (℈iij) = 1 dram (ʒj) = 60 grs.
8 drams (ʒviij) = 1 ounce (℥j) = 480 grs.
12 ounces (℥xij) = 1 lb.

Note.—For ordinary purposes the avoirdupois ounce and pound are used, but for prescriptions the above are still in use.

CAPACITY.

(*IV.*) *LIQUID MEASURE—For Water, Spirits, Wines, &c.*

4 gills = 1 pint (pt.).
2 pints = 1 quart (qt.).
4 quarts = 1 gallon (gal.).

9 gallons .	= 1 firkin	of beer.
36 gallons .	= 1 barrel	
1½ barrels or 54 gals.	= 1 hogshead	
63 gallons .	= 1 hogshead	of wine.
2 hogsheads .	= 1 pipe	

The gallon contains 10 lb. avoirdupois or 277·274 cubic inches of distilled water.

(*V.*) *DRY MEASURE—For Grains, Fruits, &c.*

2 pints = 1 quart.
4 quarts = 1 gallon.
2 gallons = 1 peck (pk.).
4 pecks = 1 bushel (bush.).
8 bushels = 1 quarter (qr.)
5 quarters = 1 load.

(VI.) APOTHECARIES' FLUID MEASURE.

60 minims (Mlx) = 1 fluid dram (f℥j).
8 fluid drams (f℥viij) = 1 fluid ounce (f℥j).
20 fluid ounces (f℥xx) = 1 pint (Oj).
8 pints (Oviij) . = 1 gallon (Cj).

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ss. = ½, as ℥ ss = ½ ounce, ℥iij ss = 3½ drams.

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1 ounce of distilled water weighs 1 ounce avoirdupois.
The pint and gallon are the same as the imperial pint and gallon.

LENGTH.

(VII.) LINEAL MEASURE.

12 inches . . = 1 foot (ft.).
3 feet . . = 1 yard (yd.).
5½ yards . . = 1 rod or pole.
40 poles (220 yds.) = 1 furlong.
8 furlongs (1760 yds.) = 1 mile.

---

4 inches = 1 hand, used in measuring horses.
6 feet = 1 fathom, used in measuring depths.
100 links (22 yards) = 1 chain, used in measuring land.
3 miles = 1 league. 69½ miles = 1 degree (nearly).

The lineal inch is also divided into 12 parts called *lines* or *seconds* (″), and a line into 12 *thirds* (‴); thus 2 feet, 7′, 8″, 11‴, is read 2 feet, 7 inches or primes, 8 seconds, and 11 thirds.

(VIII.) CLOTH MEASURE.

2¼ inches = 1 nail (1/16 yd.). 4 nails (9 inches) = 1 quarter.
4 quarters = 1 yard. 5 quarters = 1 ell.

SURFACE.

(IX.) SQUARE MEASURE.

144 square inches = 1 square foot.
9 sq. feet = 1 sq. yard.

For land:
30¼ sq. yds. (or 272¼ sq. feet) = 1 sq. rod, pole, or perch.
40 poles . = 1 rood (R.).
4 roods . = 1 acre (A.).
640 acres . = 1 sq. mile.

The following are now more generally in use :—

10,000 sq. links (16 sq. poles or 484 sq. yds.) = 1 sq. chain.
10 sq. chains (100,000 sq. links or 4840 sq. yds.) = 1 acre.

The square foot is also divided into 12 parts called *primes* (′) each = 12 square inches; the *prime* into 12 parts called *seconds* (″) each = square inch; the *second* into 12 parts called *thirds* (‴) each = $\frac{1}{12}$ of a square inch; and the *thirds* into *fourths* or square lines, &c.

ALIQUOT PARTS.

OF 1 ACRE.		OF 1 ROOD.	
2 roods	= $\frac{1}{2}$.	20 poles	= $\frac{1}{2}$.
1 ,,	= $\frac{1}{4}$.	10 ,,	= $\frac{1}{4}$.
32 poles	= $\frac{1}{8}$.	8 ,,	= $\frac{1}{5}$.
20 ,,	= $\frac{1}{8}$.	5 ,,	= $\frac{1}{8}$.
16 ,,	= $\frac{1}{10}$.	4 ,,	= $\frac{1}{10}$.

VOLUME.

(X.) *CUBIC MEASURE.*

1728 cubic inches = 1 cubic foot.
27 cubic feet = 1 cubic yard.
1760^3 cubic yards = 1 cubic mile.

The cubic foot is also divided into 12 parts called *primes* (′) each = 144 cubic inches; the *prime* into 12 parts called *seconds* (″) each = 12 cubic inches; the *second* into 12 parts called *thirds* (‴) each = cubic inch; the *third* into 12 parts called *fourths* (ıv) each = $\frac{1}{12}$ cubic inch; the *fourth* into *fifths* (v), and the *fifths* into *sixths* or cubic lines.

TIME.

(XI.) *MEASURE OF TIME.*

60 seconds = 1 minute (m.).
60 minutes = 1 hour (hr.)
24 hours = 1 day (d.).
7 days = 1 week (w.).
4 weeks (28 days) = 1 common month.
365 days (52 weeks and 1 day) = 1 common year.
365 days 6 hours . . 1 julian year.
366 days . . . . = 1 leap year.

terest, &c., 12 months, or 52 weeks, ckoned to the year, and 30 days to

into 12 calendar months, as follows :—
r, March, April, May, June, July, October, November, December.

lays have September,
une, and November ;
est have thirty-one,
ig February alone,
h we twenty-eight assign,
ry leap year twenty-nine."

ı the last two figures in the number of) by 4, or if the last two figures are t two are so divisible.

ARTERLY TERMS.

AND.	SCOTLAND.	
ırch 25.	Candlemas, .	Feb. 2.
une 24.	Whitsunday, .	May 15.
ept. 29.	Lammas, .	Aug. 1.
)ec. 25.	Martinmas, .	Nov. 11.

LINATION.

) *ANGULAR MEASURE.*

s (″) = 1 minute (′).
)s = 1 degree (°).
s 1 right angle (L).
s 1 circle.

ASURE OF NUMBER.

ı ; 12 dozen = 1 gross ; 20 units =

= 1 quire ; 20 quires = 1 ream ; 21½ ıam ; 10 reams = 1 bale.

SIZE OF BOOKS.

al, or crown) folded into 2 leaves is 4, quarto (4to) ; into 8, octavo (8vo) ; 2mo) ; and into 18, octodecimo (18mo). ignated as 24mo, 32mo, &c.

THE METRIC SYSTEM.

MONEY TABLES IN THE METRIC SYSTEM.

French Table.

10 centimes (c.) = 1 decime (d.)
10 decimes = 1 franc (fr.)

The franc = 9½d. nearly; fr. 25·22 = £1. Accounts are kept in francs and centimes. The coins in use are as follows:—Gold: 5-franc piece, 10-franc piece, and 20-franc piece or Napoleon. Silver: 20 c., 50 c., 1 fr., 2 fr., and 5 fr. Copper: 1 c., 2 c., 5 c. or sou, and 10 c.

United States Table.

10 mils (m.) = 1 cent. 10 dimes = 1 dollar ($).
10 cents = 1 dime (d.) 10 dollars = 1 eagle (E.)

1 cent = ½d. nearly; 1 dollar = 4s. 2d. nearly. Accounts are kept in dollars and cents. The coins in use are as follows:—Gold: Eagle and half-eagle. Silver: Dollar and half-dollar. Copper: Cent and half-cent.

Proposed British Table.

10 mils (m.) = 1 cent (c.) = $2\frac{2}{5}$d.
10 cents = 1 florin (fl.) = 2s.
10 florins = 1 pound or sovereign = 20s.

FRENCH WEIGHTS AND MEASURES.

The fundamental unit is the METRE = the ten-millionth part of the distance from the equator to the pole = 39·371 English inches. From it all the other units of measure or weight are derived. The prefixes used in the several tables have the following significations:—

Deca, or Deka, signifies.	10	Deci . . .	$\frac{1}{10}$
Hecto	100	Centi . . .	$\frac{1}{100}$
Kilo	1000	Milli . . .	$\frac{1}{1000}$
Myria	10000		

Length.

10 millimetres	= 1 centimetre	= $\frac{1}{100}$ metre.
10 centimetres	= 1 decimetre	= $\frac{1}{10}$,,
10 decimetre	= 1 METRE	= 39·371 Eng. in.
10 metres	= 1 dekametre	= 10 metres.
10 dekametres	= 1 hectometre	= 100 ,,
10 hectometres	= 1 kilometer	= 1000 ,,
10 kilometres	= 1 Myriametre	= 10000 ,,

1 metre = 1·094 yard (nearly). 1 yard = ·9144 metres. 1 kilometre = ·621 mile. 1 mile = 1·609 kilometre. Long distances are expressed in kilometres.

Surface.

100 sq. millimetres = 1 sq. centimetre.
100 sq. centimetres = 1 sq. decimetre.
100 sq. decimetres = 1 sq. metre, &c.

Example.—891·64083 sq. m. = 8 sq. dekam., 91 sq. m., 64 sq. decim., 8 sq. centim., and 30 sq. millim. 1 sq. metre = 10·764 sq. feet.

The following are used for measuring land :—

	1 centiare	=	1 sq. metre.
10 centiares	= 1 deciare	=	10 ,,
10 deciares	= 1 ARE	=	100 ,,
10 ares	= 1 dekare	=	1000 ,,
10 dekares	= 1 hectare	=	10000 ,,

1 hectare = 2·471 acres ; 1 acre = ·405 hectare. 1 are is equal to about 4 English perches. Very large areas are expressed in square kilometres.

Volume.

1000 cubic millimetres = 1 cubic centimetre.
1000 cubic centimetres = 1 cubic decimetre.
1000 cubic decimetres = 1 cubic metre, &c.

Example.—8976·18305679 cu. metres = 8 cu. dekam., 976 cu. m., 183 cu. decim., 56 cu. centim., 790 cu. millim. 1 cu. metre = 35·317 cu. ft. = 1·308 cu. yd.

The following are used for measuring wood :—

10 decisteres = 1 STERE = 1 cubic metre.
10 steres = 1 dekastere = 10 ,,

Capacity.

10 centilitres = 1 decilitre = $\frac{1}{10}$ litre.
10 decilitres = 1 LITRE = 1 cu. decimetre.
10 litres = 1 dekalitre = 10 litres.
10 dekalitres = 1 hectolitre = 100 ,,
10 hectolitres = 1 kilolitre = 1000 ,, = 1 cu. metre.

Litre = ·2201 gallon (nearly). 1 gallon = 4·541 litres (nearly.)

Weight.

10 milligrams = 1 centigram = $\frac{1}{100}$ gram.
10 centigrams = 1 decigram = $\frac{1}{10}$,,
10 decigrams = 1 GRAM = 15·4323 grains.
10 grams = 1 dekagram = 10 grams.
10 dekagrams = 1 hectogram = 100 ,,
10 hectograms = 1 kilogram = 1000 ,, = 1 cu. decim.
10 kilograms = 1 myriagram = 10000 ,,
100 kilograms = 1 quintal.
1000 kilograms = 1 millier or tonne = 1 cubic metre.

1 kilogram = 2·2046 lb. av. 1 lb. av. = ·4536 kilogram.

ANSWERS.

NOTE.—*The answers to which an asterisk is prefixed are also given in the text-book.*

I. (1.) Eight, six, four, seven, five, nine, three, cipher or zero, one, two, ten, seventeen, eleven, nineteen. (2.) Thirty, twenty-nine, forty-five, eighty-three, sixty-four, seventy-nine, ninety, forty-seven, eighty-one, thirty, thirteen. (3.) Six hundred and seventy-two, four hundred and nine, eight hundred and ninety-two, four hundred and sixty-five, seven hundred, six hundred and eight, one hundred and eleven, nine hundred and eleven, one hundred and one. (4.) Three hundred and two, six hundred and forty-five, nine hundred and eighty-two, two hundred and eighty-nine, eight hundred and twenty-nine, seven hundred and forty-five, nine hundred and ninety-nine, nine hundred and nine, nine hundred and nineteen. (5.) Six thousand and ten, eight thousand and nine, six thousand four hundred and fifty, seven thousand and sixty, eight thousand nine hundred and forty-five, seven thousand seven hundred and seventy-seven, seven thousand and seventy-seven, seven thousand and seven. (6.) Eighty-nine thousand six hundred and four, sixty thousand and thirty-two, seventy-four thousand five hundred and eighty, ten thousand and ten, fifty-four thousand three hundred and twenty-one, fifty thousand three hundred and twenty-one, fifty thousand and twenty-one. (7.) Six hundred and forty-eight thousand nine hundred and eighty-three, six hundred and one thousand and three, eight hundred and ninety-six thousand and ten, eight hundred and ninety-six thousand four hundred and fifteen,

seven hundred and seven thousand and nine, seven hundred and seventy thousand and ninety. (8.) Seven hundred and forty-eight thousand six hundred and eleven, nine hundred and fifty-four thousand three hundred and twenty-one, eight hundred and sixty-five thousand four hundred, six hundred and eighty-one thousand one hundred and ten, six hundred thousand and six, five hundred thousand and fifteen. (9.) Sixty-five millions four hundred and eighty-nine thousand six hundred and seventy-five, four millions one hundred thousand eight hundred and ninety-three, seven hundred and fifty-four millions eight hundred and ninety-six thousand four hundred and thirty-two, eight hundred and seven millions six thousand and fifty. (10.) Ten millions nine thousand and six hundred, eight millions six hundred and forty-five thousand one hundred and forty-two, one thousand two hundred and thirty-four millions five hundred and sixty-seven thousand eight hundred and ninety, eight hundred and forty-five thousand six hundred and ninety-eight millions nine hundred and twenty-one thousand one hundred and forty-five, six billions eight hundred and ninety-five thousand four hundred and eighty-nine millions six hundred and forty thousand four hundred and fifteen. (11.) 700 +20+4, 800+90+6, 700+40, 600+9. (12.) 8000+70 +2, 6000+900+9, 8000+6, 7000+800+30+2. (13.) 90000+6000+800+40+3, 70000+8000+900+60, 60000 +90+6, 80000+3000+1. (14.) 800000+70000+6000 +100+1, 900000+7000+800+10, 300000+600+10+8, 3000000+800000+100+10+3. (15.) 34, 908, 863, 780. (16.) 8096, 9708. (17.) 91869, 117078.

II. (1.) 5, 6, 9, 8, 4, 3, 2, 1, 7. (2.) 42, 89, 55, 67, 30, 21. (3.) 563, 911, 784, 1140. (4.) 782, 909, 474, 201, 389. (5.) 5609, 6311, 1419, 6400, 5080. (6.) 74001, 86090, 61500, 50050, 61809, 9009. (7.) 540000, 600043, 75060, 80088, 200021. (8.) 3000003, 2000020, 75000064, 629061008, 784345282. (9.) 500864250509, 861344595101, 4000064008070. (10.) 19000018017015, 71000505060007, 35007019004511, 643242375809572.

III. (1.) 100, 999. (2.) 100000, 999999. (3.) A million ; a billion. (4.) Four thousand four hundred and

six feet, fifteen thousand seven hundred and forty-four feet, twenty-nine thousand feet, eighteen thousand feet, twenty-three thousand nine hundred and ten feet. (5.) Fifty-eight thousand square miles, thirty-one thousand square miles, thirty-three thousand square miles, eight millions six hundred thousand square miles, fifty-one millions five hundred thousand square miles. (6.) 500-000000, 490000000, 100000000, 68000000, 16000000, 1215000000. (7.) 35649000, 66614000, 92093000, 140-322000, 479141000. (8.) 1766565000, 2766133000. (9.) 21000000000000. (10.) 33908000000000000.

IV. (1.) 5, 7, 4, 6, 10, 9, 11, 8, 12, 1, 3, 2. (2.) 100, 90, 110, 150, 120, 209, 219, 40, 58, 72. (3.) 1500, 1400, 500000, 100000, 1740, 1679, 1872. (4.) III., VI., IX., X., XI., XII., XVIII., XVII., XVI., XIX., XXI. (5.) XXXVI., XLIII., LXXV., LXXXIV., XCVII., CCIV., DVI., DCCCXXIX., MCCCCL. or MCDL., MDCCCLXXIII. (6.) DCCCL., DCCLXXVI., CDXC., CDXLIX. (7.) CDIV., CD., CCCLXVI., CCCLIX., CXLVI. (8.) DCCLIII., DIX., C., XXX., CCCXXIV., CDLXX. (9.) DLXXI., DCCC., CMXCI., MXCVI., MCCXCI., MCCCVII., MCDXCII. (10.) DLXXXII., DCCCXXVII., MLXVI., MCLIV., MCCLXV., MCCCXIV., MCCCXCIX., MCDLXI., MCDLXXXV.

V. (1.) *99. (2.) 99. (3.) 131. (4.) 198. (5.) 153. (6.) *796. (7.) 2647. (8.) 2038 (9.) 11111111101110. (10.) 14091113790054. (11.) 14805041977245. (12.) 26296296333208. (13.) 10625648386565. (14.) 262387-95493167. (15.) 28853. (16.) 31165. (17.) 23318. (18.) 11759. (19.) 465131. (20.) 269839. (21.) 102091. (22.) 97413. (23.) 393802. (24.) 374886. (25.) 3685053. (26.) 3908241. (27.) 1872651. (28.) 2582264. (29.) 49385484609. (30.) 41095141490. (31.) 36555. (32.) *102352. (33.) 237837. (34.) 19020. (35.) 168261. (36.) 521176. (37.) 450804. (38.) 1160299. (39.) 453-4381. (40.) 3942180. (41.) 55922082. (42.) 39454576. (43.) 363139707. (44.) 3955809. (45.) 3928483. (46.) 194833. (47.) 175812. (48.) 8760117. (49.) 781275-14010. (50.) 78077319473. (51.) *2123925. (52.) 193-

(72890,000,000,000,000.) (10.) 29743000 millions (29743-000,000,000).

XV. (1.) 361. (2.) 441. (3.) 1849. (4.) 4761. (5.) 5476. (6.) 804609. (7.) 487204. (8.) 502681. (9.) 651249. (10.) 46036225. (11.) 4913. (12.) 12167. (13.) 68921. (14.) 493039. (15.) 804357. (16.) 642-735647. (17.) 491169069. (18.) 223648543. (19.) 533-411731. (20.) 13980103929. (21.) *96577. (22.) 1430-309. (23.) 118083420. (24.) 338200000. (25.) 504000-000. (26.) *18632. (27.) 638. (28.) 952. (29.) 4200. (30.) 0.

XVI. (1.) 6766551, 6698202, 6629853. (2.) 42924033, 42881066, 42838099. (3.) 35980686, 46260882, 30840588. (4.) 82304100, 72481800, 54869400. (5.) 876694, 1146-446, 1213884, 1281322. (6.) 126969336, 1447951752.

XVII. (1.) 0; no, because the multiplier must always be abstract. (2.) 0. (3.) 215441. (4.) 10121s. (5.) 8347248. (6.) 4032, 8 times, 7 times, 20 times, 32256, 28224, 80640. (7.) £140. (8.) 65268. (9.) 4. (10.) 1566 yards. (11.) 1150 gals.

XVIII. (1.) $*\frac{10}{3}$, $\frac{18}{4}$, $\frac{12}{7}$, $\frac{35}{9}$, $\frac{40}{11}$, $\frac{66}{12}$. (2.) $\frac{60}{8}$, $\frac{52}{11}$, $\frac{40}{9}$, $\frac{143}{14}$, $\frac{306}{19}$, $\frac{252}{33}$. (3.) $\frac{48}{8}$, $\frac{20}{3}$. (4.) $*\frac{14}{3}$, $*\frac{24}{5}$, $\frac{88}{10}$, $\frac{63}{7}$, $\frac{97}{11}$, $\frac{88}{9}$, $\frac{121}{13}$, $\frac{111}{14}$, $\frac{154}{13}$. (5.) $\frac{168}{9}$, $\frac{152}{7}$, $\frac{3084}{9}$, $\frac{10775}{12}$, $\frac{9694}{13}$, $\frac{11899}{14}$, $\frac{18562}{21}$. (6.) $*\frac{54}{9}$, $\frac{88}{11}$, $\frac{176}{11}$, $\frac{168}{12}$, $\frac{551}{17}$, $\frac{899}{29}$. (7.) $*\frac{42}{9}$, $\frac{66}{11}$, $*\frac{12}{11}$, $\frac{44}{13}$, $\frac{52}{7}$. (8.) $\frac{42}{7}$, $\frac{5}{10}$, $\frac{21}{11}$, $\frac{19}{8}$. (9.) $*\frac{32}{8}$, $\frac{33}{11}$. (10.) $\frac{19}{7}$, $\frac{65}{9}$. (11.) 10. (12.) $\frac{216}{6}$ of a mile.

XIX. (1.) *34922582, *232817211/3, *17461291. (2.) 43819247 1/2, 29212831 2/3, 21909623 1/4. (3.) 246913580 1/4, 19753086 4/5, 16460905 1/3. (4.) 191224182/7, 15297934 2/5, 12748279. (5.) 17636684 1/7, 15432098 5/8, 13717421. (6.) 58598694/9, 51273857/8, 45576763/9. (7.) 9738871, 7968167 2/11, 7304153 3/12. (8.) 76100566/9, 6226410, 5707542 6/12. (9.) 27030399 1/3, 16218239 2/3, 11584456 4/9. (10.) 438229868 1/2, 219114934 1/4, 146076622/8. (11.) 66918378, 52047627 3/9, 42584422 4/11. (12.) 22632921 5/8, 16974691 3/8, 11316460 11/16. (13.) 69836514 + R 3, 59859869 + R 4, 52377385 + R 7. (14.) 33896766 + R 7, 27733718 + R 3, 25422575 + R 1.

(15.) 83256731 + R 3, 59469094, 46253739 + R 7. (16.) $84583214\frac{6}{10}$, $8458321\frac{46}{100}$, $845832\frac{146}{1000}$. (17.) $6432146\frac{30}{100}$, $643214\frac{630}{1000}$, $64321\frac{4630}{10000}$. (18.) $2085267\frac{420}{10}$, $166821\frac{3930}{100}$, $11915814\frac{1}{10}$. (19.) $187104\frac{12}{800}$, $249472\frac{12}{800}$, $166314\frac{12}{800}$. (20.) $6948910\frac{743}{11000}$, $1273942\frac{743}{60000}$, $636991\frac{563}{1200}$.

Note.—It is sufficient for the pupils to remember at present that to multiply a fraction we multiply the numerator, and to divide a fraction we multiply the denominator.

XX. (1.) $*12\frac{6}{7}$, $*13\frac{7}{9}$, $*10\frac{9}{11}$, $*84\frac{1}{5}$. (2.) $161\frac{2}{6}$, 106, $97\frac{3}{5}$, $81\frac{9}{12}$. (3.) $126\frac{8}{9}$, $137\frac{2}{10}$, $152\frac{8}{11}$, $164\frac{8}{12}$. (4.) $*2\frac{3}{5}$, $*6\frac{4}{7}$, $3\frac{2}{5}$, $2\frac{4}{7}$. (5.) $3\frac{3}{5}$, $3\frac{3}{7}$, $3\frac{5}{7}$, $7\frac{7}{8}$. (6.) *60, *39, $51\frac{3}{4}$, 109. (7.) $*\frac{4}{45}$, $*\frac{6}{56}$, $\frac{3}{24}$, $\frac{3}{42}$. (8.) $\frac{5}{63}$, $\frac{6}{28}$, $\frac{4}{72}$, $\frac{7}{72}$. (9.) $*\frac{20}{27}$, $*\frac{114}{121}$, $\frac{45}{100}$, $\frac{105}{121}$. (10.) $1\frac{19}{25}$, $\frac{27}{28}$, $1\frac{13}{15}$, $1\frac{8}{35}$. (11.) $3\frac{5}{12}$, $1\frac{27}{30}$, $\frac{49}{55}$, $\frac{35}{36}$. (12.) $\frac{21}{35}$, $\frac{72}{80}$, $\frac{20}{21}$, $\frac{24}{36}$.

XXI. (1.) $*6974706\frac{12}{14}$, $*6509726\frac{4}{16}$, $*6102868\frac{4}{16}$. (2.) $4807488\frac{12}{14}$, $4120704\frac{13}{21}$, $3933399\frac{7}{22}$. (3.) $3142653\frac{22}{24}$, $2793469\frac{4}{27}$, $2693702\frac{14}{28}$. (4.) $2182805\frac{28}{32}$, $1587495\frac{6}{14}$, $1455203\frac{28}{28}$. (5.) $2824038\frac{4}{25}$, $2139423\frac{15}{33}$, $1568910\frac{18}{45}$. (6.) $1988534\frac{8}{35}$, $1933296\frac{24}{36}$, $1657111\frac{36}{42}$. (7.) $2034552\frac{24}{54}$, $1664633\frac{54}{60}$, $1525914\frac{24}{60}$. (8.) $1554078\frac{17}{49}$, $1189841\frac{2}{64}$, $865338\frac{9}{88}$. (9.) $1094364\frac{50}{55}$, $955397\frac{9}{63}$, $1074822\frac{34}{56}$. (10.) 9997544 + R 12, 9164415 + R 40, 8018863 + R 52. (11.) 4267640 + R 72, 3491706 + R 18, 3200730 + R 72. (12.) 1817161 + R 62, 1665731 + R 51, 1526920 + R 63. (13.) $1764481\frac{21}{400}$, $1543921\frac{24}{600}$, $900628\frac{06}{2000}$. (14.) $837039\frac{608}{81000}$, $684849\frac{608}{800000}$, $627\frac{849608}{1080000}$. (15.) $3555\frac{46967}{121000}$, $325\frac{1291967}{1320000}$, $298\frac{1081967}{1440000}$.

XXII. (1.) $*68980931\frac{2}{3}$, $*5275012\frac{3}{14}$, $*4719747\frac{9}{19}$, $*3898922\frac{12}{28}$. (2.) $1123705\frac{6}{28}$, $1051208\frac{28}{31}$, $880742\frac{1}{31}$. 7948161. (3.) $287108\frac{8}{45}$, $262674\frac{9}{47}$, $209248\frac{7}{48}$, $202388\frac{14}{41}$. (4.) $147411\frac{9}{37}$, $139106\frac{24}{41}$, $135295\frac{11}{48}$, $125019\frac{53}{44}$. (5.) $133868\frac{7}{83}$, $124843\frac{49}{79}$, $114547\frac{26}{97}$, $110\frac{1}{101}$. (6.) $423319\frac{5}{103}$, $407494\frac{7}{107}$, $400017\frac{12}{109}$, $385857\frac{112}{113}$. (7.) $508589\frac{39}{127}$, $493059\frac{120}{131}$, $471465\frac{50}{137}$, $464682\frac{77}{139}$. (8.) $588208\frac{1128}{149}$, $444888\frac{7188}{107}$, $341023\frac{8409}{157}$. (9.) $662251\frac{684}{161}$, $502512\frac{1125}{167}$, $380228\frac{197}{263}$. (10.) $628741\frac{14}{167}$, $467831\frac{119}{211}$, $366960\frac{468}{269}$. (11.) 53772890, $39304847\frac{189}{223}$, $32343103\frac{147}{277}$. (12.) $3671560\frac{726}{265}$, $2983836\frac{224}{281}$, $2538945\frac{884}{286}$. (13.) $1693488\frac{460}{379}$, $1839060\frac{300}{349}$, $1569271\frac{682}{409}$. (14.) $963613\frac{927}{795}$, $779092\frac{1522}{987}$, $974605\frac{746}{789}$.

(15.) $149822\frac{1086}{6713}$, $1133288\frac{544}{8013}$, $132768\frac{2066}{7603}$. (16.) $420\text{-}230\frac{599}{1587}$, $215470\frac{629}{8007}$, $298567\frac{3243}{6438}$. (17.) $1430396\frac{4227}{6419}$, $1047662\frac{3383}{8764}$, $933196\frac{707}{9895}$. (18.) $475540\frac{18439}{31567}$, $183\text{-}373\frac{87114}{89643}$. (19.) $1001216\frac{1093}{67809}$, $1486142\frac{31851}{45683}$. (20.) $17868\frac{117016}{830061}$, $32470\frac{208134}{455789}$. (21.) $141844\frac{113264}{879841}$, $489\text{-}890\frac{627902}{1968143}$. (22.) 9595 + R 4722613, 5278 + R 5330-654. (23.) 7935045 + R 77686, 719906 + R 944086. (24.) 1037851 + R 34489, 9993 + R 59961489. (25.) 45182 + R 8751483, 12457 + R 13911483.

XXIII. (1.) 815; increased; 5 times greater. (2.) $7204\frac{8}{12}$; diminished; 6 times less; the quotient would be the same, but the remainder (not expressed as a part of the quotient) would be 6 times greater. (3.) 6496809-764. (4.) 69784. (5.) $164162\frac{512}{2800}$. (6.) 964875983. (7.) 60. (8.) 6095. (9.) 39. (10.) 4; 4; 4.

XXIV. (1.) £268. (2.) £439. (3.) 1980 times. (4.) 36 days. (5.) 91 minutes; 19 minutes. (6.) 57s. (7.) £2. (8.) £7909. (9.) $29062\frac{4}{5}$. (10.) 127 days; 254 days.

XXV. (1.) $*\frac{7}{8}$, $*\frac{4}{6}$, $\frac{11}{12}$, $\frac{2}{3}$. (2.) $\frac{3}{8}$, $\frac{4}{7}$, $\frac{5}{6}$, $\frac{4}{5}$. (3.) $\frac{11}{12}$, $\frac{25}{26}$, $\frac{12}{13}$, $\frac{29}{30}$. (4.) $*\frac{1}{3}$, $2\frac{6}{32}$. (5.) $\frac{2}{5}$, $\frac{9}{11}$, $\frac{9}{64}$. (6.) $\frac{2}{4}$, $\frac{4}{27}$, 1. (7.) $*\frac{3}{4}$, $1\frac{1}{4}$, $1\frac{8}{13}$. (8.) $1\frac{1}{2}$, $\frac{2}{3}$, 3. (9.) $\frac{8}{27}$, $\frac{2}{9}$, $\frac{63}{160}$. (10.) No difference. (11.) $\frac{4}{5}$, $\frac{1}{2}$, 1. (12.) $4\frac{2}{5}$, $1\frac{1}{3}$, $3\frac{9}{11}$.

XXVI. (1.) $*\frac{6}{8}$, $\frac{4}{10}$, $\frac{6}{9}$, $\frac{15}{27}$. (2.) $*\frac{2}{4}$, $\frac{2}{4}$, $\frac{1}{4}$; $\frac{2}{6}$, $\frac{2}{6}$, $\frac{4}{6}$; $\frac{8}{12}$, $\frac{9}{12}$, $\frac{6}{12}$, $\frac{10}{12}$; $\frac{5}{10}$, $\frac{6}{10}$, $\frac{9}{10}$, $\frac{10}{10}$. (3.) $\frac{12}{18}$, $\frac{15}{18}$, $\frac{14}{18}$, $\frac{6}{18}$; $\frac{8}{10}$, $\frac{9}{10}$, $\frac{6}{10}$, $\frac{5}{10}$; $\frac{10}{12}$, $\frac{6}{12}$, $\frac{8}{12}$, $\frac{2}{12}$; $\frac{10}{14}$, $\frac{11}{14}$, $\frac{6}{14}$, $\frac{2}{14}$, $\frac{9}{14}$. (4.) $*1\frac{1}{4}$, $*\frac{2}{4}$, $\frac{1}{4}$, $\frac{7}{8}$, $\frac{5}{8}$. (5.) $\frac{21}{24}$, $\frac{21}{24}$, $\frac{24}{24}$. (6.) $*5\frac{2}{3}$, $10\frac{1}{4}$, $6\frac{5}{6}$, $6\frac{1}{9}$. (7.) $8\frac{7}{12}$, $19\frac{7}{10}$, $17\frac{13}{14}$. (8.) $*\frac{1}{2}$, $\frac{5}{12}$, $\frac{1}{20}$, $\frac{1}{10}$. (9.) $*1\frac{3}{4}$, $\frac{1}{2}$, $2\frac{7}{10}$, $4\frac{13}{14}$. (10.) $1\frac{9}{10}$, $2\frac{13}{14}$, $2\frac{5}{6}$, $7\frac{5}{9}$.

XXVII. (1.) $9\frac{1}{6}$, $8\frac{8}{9}$, $5\frac{1}{12}$, $8\frac{1}{4}$. (2.) $33\frac{1}{3}$, $32\frac{1}{5}$, $49\frac{5}{7}$, $17\frac{2}{3}$. (3.) $160\frac{1}{2}$, 27, $151\frac{1}{5}$, $210\frac{2}{7}$. (4.) $\frac{6}{35}$, $\frac{1}{18}$, $\frac{2}{9}$, $\frac{5}{6}$. (5.) $\frac{11}{108}$, $\frac{2}{33}$, $\frac{2}{21}$, $1\frac{67}{8}$. (6.) $\frac{22}{25}$, $\frac{3}{4}$, $\frac{6}{11}$, $\frac{8}{9}$. (7.) $*\frac{8}{15}$, $*\frac{3}{4}$, $\frac{8}{21}$. (8.) $\frac{1}{3}$, $\frac{7}{10}$, $\frac{4}{7}$. (9.) $\frac{24}{35}$, $\frac{8}{63}$, 1. (10.) $*10\frac{1}{12}$, $*30\frac{1}{5}$, 35. (11.) $61\frac{17}{63}$, $\frac{6}{35}$, $70\frac{1}{12}$. (12.) $\frac{2}{15}$, $11\frac{1}{4}$. (13.) $\frac{4}{27}$, 5. (14.) $31\frac{1}{3}$, $5\frac{5}{7}$. (15.) $29\frac{1}{3}$, $40\frac{19}{21}$. (16.) $*1\frac{12}{14}$, $*11\frac{1}{16}$, $1\frac{1}{10}$, $1\frac{1}{2}$. (17.) $1\frac{1}{15}$, $\frac{6}{11}$, $1\frac{1}{14}$, $\frac{33}{35}$. (18.) $*\frac{26}{39}$, $*17\frac{1}{5}$, $1\frac{28}{77}$. (19.) $1\frac{1}{3}$, $2\frac{1}{4}$, $\frac{4}{5}$. (20.) $*\frac{1}{16}$, $\frac{1}{20}$. (21.) $\frac{3}{4}$, $1\frac{1}{2}$. (22.) $*1\frac{1}{30}$, $7\frac{1}{5}$. (23.) $*4\frac{4}{5}$, $\frac{9}{16}$. (24.) $21\frac{1}{8}$, $\frac{1}{16}$. (25.) 5, $6\frac{1}{4}$. (26.) $7\frac{1}{12}$, $12\frac{26}{51}$. (27.) $*\frac{5}{6}$, $\frac{5}{36}$. (28.) 12, $2\frac{2}{3}$.

XXVIII. (1.) *$\frac{1}{2}$, *$\frac{1}{3}$, $\frac{1}{4}$, $1\frac{1}{8}$. (2.) $\frac{2}{7}$, $\frac{6}{11}$, $\frac{2}{10}$, $\frac{11}{12}$. (3.) $2\frac{1}{4}$, $1\frac{1}{3}$. (4.) *$\frac{1}{5}$, *$\frac{2}{3}$, $1\frac{7}{16}$. (5.) $\frac{2}{5}$, $5\frac{1}{4}$, $\frac{9}{16}$. (6.) *$11\frac{1}{8}$. (7.) $16\frac{9}{20}$. (8.) $13\frac{3}{8}$. (9.) $22\frac{3}{4}$. (10.) £$12\frac{1}{2}$. (11.) $\frac{1}{28}$, $\frac{1}{18}$, $\frac{1}{24}$.

Note.—In the following answers all fractions are reduced to their lowest terms, unless where this cannot be easily done without a knowledge of the G. C. M.

XXIX. (1.) *3492, *$4916\frac{1}{3}$. (2.) $2247\frac{3}{4}$, 3216. (3.) $125201\frac{1}{4}$, $16295\frac{5}{6}$. (4.) *$39401\frac{1}{4}$, *$82699\frac{5}{6}$. (5.) $305325\frac{5}{11}$, $326429\frac{5}{11}$. (6.) $1053876\frac{1}{12}$, $1346556\frac{3}{4}$. (7.) *2376339, *$3691614\frac{1}{3}$. (8.) $6093768\frac{3}{4}$, $4431155\frac{5}{8}$. (9.) $5480222\frac{3}{8}$, $4968030\frac{3}{7}$. (10.) *$7437909\frac{5}{7}$, *$13157483\frac{3}{9}$. (11.) $46738898\frac{2}{11}$, $183841606\frac{2}{5}$. (12.) 2651797744, $567793867813\frac{1}{4}$. (13.) $8815316601\frac{7}{17}$, $58116479617\frac{3}{4}$. (14.) *154663 + R $\frac{1}{2}$, *132215 + R $1\frac{1}{4}$. (15.) 144774 + R $2\frac{1}{3}$, 94086 + R 6. (16.) 10112 + R $5\frac{3}{4}$, 12276 + R $4\frac{5}{8}$. (17.) *$55070\frac{25}{56}$, *$39870\frac{36}{161}$. (18.) $2929501\frac{88}{2728}$, $11882\frac{81}{7129}$. (19.) $74971\frac{601}{1000}$, $87561\frac{1005}{1015}$. (20.) *$38936\frac{4}{5}$, *$58391\frac{57}{5}$. (21.) 7866871, $6664998\frac{1}{12}$. (22.) $1610362983\frac{2}{3}$, $24483807\frac{11}{13}$. (23.) $159188834\frac{2}{7}$, $48709883\frac{11}{14}$. (24.) $108781809\frac{7}{10}$, $28275587\frac{619}{1000}$. (25.) $376076353\frac{5}{7}$, $492347668\frac{2}{13}$. (26.) *91835 + R $4\frac{2}{5}$, *106785 + R $7\frac{5}{13}$. (27.) 70451 + R $\frac{2}{11}$, 72839 + R $4\frac{7}{16}$. (28.) 261716 + R $18\frac{1}{5}$, 304838 + R $11\frac{5}{6}$. (29.) *$116032\frac{485}{877}$, *$90974\frac{139}{154}$. (30.) $418341\frac{6}{161}$, $256831\frac{169}{341}$. (31.) $143043\frac{282}{391}$, $94407\frac{476}{1095}$.

XXX. (1.) 27105. (2.) 5563723898547. (3.) MDXCVI. (4.) 62001. (5.) 3484. (6.) 3590887897889. (7.) 8638197888890. (8.) 2557. (9.) Eight hundred and ninety-seven thousand and sixty-eight millions six hundred and forty-three thousand and nine. (10.) 101. (11.) 1269. (12.) Eight billions nine hundred and seventy-six thousand and one millions nine hundred and one thousand eight hundred and ninety-three. (13.) 30. (14.) 91. (15.) 6th. (16.) 17375844843216. (17.) 433961611402671. (18.) 115623187. (19.) 52. (20.) Cart £8, horse £19. (21.) 460. (22.) 79790859192. (23.) 181755. (24.) 11236674051. (25.) 8133. (26.) 7, 43, 100, 86. (27.) MXCVI., MCCXCI. (28.) $624614\frac{85}{108}$. (29.) 268 on 1st, 301 on 2d, and 404 on 3d. (30.) $201020265\frac{1713}{60000}$. (31.) 49430. (32.) 1134. (33.) 1429639672176. (34.) 684806769405000. (35.) 2401, 50653. (36.) 44. (37.) 21115. (38.) 33000 times. (39.) $77466\frac{2423}{3970}$. (40.) 40.

(41.) £69654. (42.) 450. (43.) 145 miles. (44.) 4495. (45.) £31. (46.) 7106715. (47.) 3628800. (48.) 8 days. (49.) £5370. (50.) 36 miles. (51.) 36. (52.) 65 years. (53.) 14481072. (54.) 477. (55.) £185$\frac{1}{3}$. (56.) 19530. (57.) Gained 213s. (58.) 513000. (59.) 4200. (60.) 45. (61.) 21996. (62.) £64. (63.) 366$\frac{2}{7}$. (64.) 38 and 10 men over. (65.) 2280. (66.) 301. (67.) 364. (68.) 1854$\frac{29}{41}$. (69.) Each man 24s., boy 4s. (70.) Each son 252, and each daughter 126. (71.) 11$\frac{5}{9}$. (72.) 844$\frac{5}{6}$. (73.) 20988$\frac{1}{11}$. (74.) 26481522468484$\frac{4}{5}$. (75.) 62$\frac{3}{4}$. (76.) $\frac{3}{7}$. (77.) 2$\frac{2}{7}$. (78.) 172$\frac{3}{4}$. (79.) 74$\frac{2}{3}$, 27$\frac{2}{7}$, 7$\frac{7}{11}$, 21$\frac{7}{9}$. (80.) $\frac{259}{4}$, $\frac{161}{9}$, $\frac{515}{12}$, $\frac{69}{7}$. (81.) $\frac{72}{8}$, $\frac{48}{5}$. (82.) 420. (83.) 5937$\frac{1}{2}$. (84.) 2$\frac{2}{5}$, 3$\frac{3}{7}$, $\frac{3}{28}$, $\frac{6}{35}$. (85.) 26$\frac{2}{5}$, 29$\frac{1}{7}$, 1$\frac{7}{30}$, 1$\frac{9}{35}$. (86.) A man 106, and a woman 53. (87.) $\frac{8}{21}$, $\frac{5}{12}$, $\frac{2}{35}$, $\frac{7}{10}$. (88.) $\frac{6}{7}$, $\frac{7}{10}$, $\frac{14}{15}$, $\frac{4}{5}$. (89.) 15$\frac{3}{4}$, 28, 347$\frac{5}{8}$. (90.) $\frac{2}{35}$, 1$\frac{23}{28}$, $\frac{4}{21}$. (91.) 19$\frac{19}{55}$. (92.) 1$\frac{31}{90}$. (93.) 2421. (94.) 165$\frac{1}{3}$. (95.) 3, $\frac{3}{4}$, $\frac{1}{18}$. (96.) 189. (97.) 440421$\frac{1}{7}$, 543083$\frac{2}{7}$. (98.) 253181$\frac{1}{4}$, 368213$\frac{1}{2}$. (99.) 3830$\frac{65}{81}$, 3433 + R 17$\frac{5}{7}$. (100.) 12289$\frac{3}{17}$, 323 + R 19$\frac{3}{8}$. (101.) £4 too much. (102.) 7. (103.) 2$\frac{1}{5}$. (104.) 1$\frac{16}{25}$. (105.) 5$\frac{6}{19}$. (106.) $\frac{5}{28}$, 5$\frac{3}{5}$. (107.) $\frac{380}{1025}$, $\frac{135}{65}$, $\frac{1}{7}$. (108.) 67$\frac{2}{5}$. (109.) 1$\frac{1}{2}$ days. (110.) $\frac{5}{11}$. (111.) 9, $\frac{1}{16}$. (112.) $\frac{2}{5}$. (113.) 0. (114.) $\frac{1}{2}$. (115.) 2$\frac{1}{10}$. (116.) $\frac{7}{20}$. (117.) 9.

XXXI. (1.) *1860s., 9520s., 17480s. (2.) 1869s., 16128s., 10416s. (3.) 860s., 1029s., 1792s. (4.) 4890s., 2502s. 6d., 20852s. 6d. (5.) *215040d., 225792d., 117000d. (6.) 24960d., 26664d., 105360d. (7.) *861120f., 85440f., 131880f. (8.) *19753s., 9479s., 17131s. (9.) 1756s., 4459s., 8545s. 6d. (10.) 20154d., 178244d., 155013d. (11.) *880002f., 856208f., 780557f. (12.) 50050f., 43143f., 99006f. (13.) 22888 half-pence, 46353 half-pence, 53707 half-pence. (14.) 2935 half-pence, 23147 half-pence, 47519 half-pence. (15.) 39275 six-pences, 8371 threepenny-bits, 342 fourpenny-bits and 2d.

XXXII. (1.) *2442d., 1244d., 4380$\frac{1}{2}$d. (2.) *£98, 7s.; £144, 18s.; £99, 8s. (3.) 823s.; 365s. 2d.; 203s. 9$\frac{1}{2}$d. (4.) 1597$\frac{1}{2}$d., 1095$\frac{1}{2}$d., 813$\frac{3}{5}$d. (5.) *£101, 15s. 2$\frac{1}{2}$d.; £91, 5s. 10$\frac{1}{2}$d.; £71, 3s. 5d. (6.) £38, 5s. 6$\frac{1}{4}$d.; £101, 15s. 1d.; £20, 13s. 4$\frac{3}{4}$d. (7.) £205, 14s. 3d.; £203, 2s. 11$\frac{1}{2}$d.; £106, 4s. 8$\frac{1}{2}$d. (8.) 166 half-sovereigns, 3s. 4$\frac{1}{2}$d.; 307 half-sovereigns, 0s. 5$\frac{1}{2}$d.; £51, 15s. 3$\frac{1}{4}$d. (9.) £71, 16s. 6$\frac{3}{4}$d.; 762 guineas, 7s. 6$\frac{3}{4}$d.; 1914 guineas, 2s. 3$\frac{1}{2}$d. (10.) £649,

17s. 6d.; £162, 14s. 4d.; £3735, 11s. 11d. (11.) 180 crowns; 364 half-crowns, 2s.; 17 half-crowns. (12.) 3 half-guineas, 8s. 6d.; 17 half-guineas; £992, 5s. (13.) 29 guineas, 15s. 9d.; 79 guineas, 16s. 4½d.; £93, 9s. (14.) £976, 18s.; 2325 guineas, 15s; 1043 guineas, 7s. (15.) 967 guineas; 2325 half-guineas, 9s.; 213 half-guineas, 6s.

XXXIII. (1.) *6, 8, 11. (2.) 9, 12, 19. (3.) 5, 9, 11. (4.) $3\frac{1}{2}$, $5\frac{1}{3}$, $9\frac{1}{4}$. (5.) *$\frac{2}{3}$, $\frac{5}{6}$, $\frac{5}{9}$. (6.) $\frac{2}{3}$, $\frac{81}{121}$, $\frac{22}{35}$. (7.) $\frac{13}{17}$, $\frac{10}{13}$, $\frac{121}{2268}$. (8.) *$\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$. (9.) $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$. (10.) $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{16}$. (11.) $\frac{3}{5}$, $\frac{3}{4}$, $\frac{2}{3}$. (12.) $\frac{1}{4}$, $\frac{5}{24}$, $\frac{7}{36}$. (13.) *$\frac{2}{3}$, $\frac{3042}{3324}$, $\frac{4102}{5389}$.

XXXIV. (1.) 18s. 4½d. (2.) £20, 2s. 11d. (3.) £27, 7s. (4.) £39, 1s. 4½d. (5.) £416, 13s. 4d. (6.) £10000. (7.) £468750. (8.) 160. (9.) $31\frac{67}{88}$. (10.) $14\frac{2}{23}$. (11.) 8. (12.) £6, £5, £4, £2.

XXXV. (1.) *£280, 18s. 8d. (2.) *£304, 5s. 5d. (3.) *£157, 10s. 3d. (4.) £1254, 10s. 2½d. (5.) 1962, 16s. 9¼d. (6.) £1904, 2s. 0d. (7.) £3961, 0s. 10d. (8.) £2959, 12s. 1¼d. (9.) £4069, 19s. 3½d. (10.) £1943, 1s. 11¾d. (11.) £4304, 3s. 10½d. (12.) £7127, 14s. 10d. (13.) £5292, 4s. 1½d. (14.) £4638, 3s. 3½d. (15.) £3337, 8s. 11¾d. (16.) £2313, 0s. 9d. (17.) £3117, 12s. 8½d. (18.) £4483, 15s. 11d. (19.) £9981, 19s. 0½d. (20.) £41508, 9s. 7½d. (21.) £46206, 9s. 3¾d. (22.) *£11582, 7s. 0¾d. $\frac{3}{5}$. (23.) £7042, 19s. 4½d. $\frac{5}{6}$. (24.) £26741, 2s. 0½d. $\frac{2}{11}$. (25.) £14132, 1s. 10½d. $\frac{2}{3}$. (26.) £19141, 1s. 4½d. $\frac{1}{6}$. (27.) £20529, 11s. 3¾d. $\frac{23}{30}$. (28.) £16009, 7s. 2¾d. $\frac{2}{11}$. (29.) £13613, 4s. 9½d. $\frac{13}{16}$. (30.) £32232, 10s. 9¾d. $\frac{7}{12}$. (31.) £4461, 10s. 11½d. $\frac{17}{26}$. (32.) £24904, 19s. 6¼d. (33.) £15218, 12s. 11½d. $\frac{29}{34}$.

XXXVI. (1.) £31398, 7s. 7½d. $\frac{35}{36}$. (2.) £32662, 17s. 4½d. $\frac{9}{25}$. (3.) £5, 3s. 11½d. (4.) £8, 11s. 4¾d. (5.) £174, 4s. (6.) £303, 3s. 6d. (7.) £1834, 7s. (8.) £1010, 5s. 2d. (9.) £79, 8s. 8½d. (10.) £1958, 8s. 0½d. (11.) £4847, 1s. (12.) £12116, 4s. 5¾d.

XXXVII. (1.) *£20, 3s. 3d. (2.) *£8, 2s. 2d. (3.) *£889, 6s. 3½d. (4.) *£258, 2s. 1½d. (5.) *£4, 3s. 11½d. (6.) *£176, 19s. 2½d. (7.) £308, 2s. 1¾d. (8.) £91, 2s. 9¾d. (9.) £78, 17s. 10¾d. (10.) £287, 19s. 2¾d. (11.) £251, 5s. 11¾d. (12.) £288, 18s. 0½d. (13.) £78, 0s. 10d.

(14.) £184, 19s. 10½d. (15.) £1902, 11s. 4½d. (16.) £796, 18s. 10¾d. (17.) £7887, 18s. 7¾d. (18.) £4056, 11s. 6½d. (19.) £561, 18s. 10⅝d. (20.) £7789, 1s. 10½d. (21.) £7774, 19s. 8¾d. (22.) £2876, 18s. 11¾d. (23.) £8956, 15s. 11½d. (24.) £7888, 18s. 10½d. (25.) *£24, 13s. 10½d. $\frac{9}{10}$. (26.) £18, 2s. 11½d. $\frac{8}{9}$. (27.) £542, 19s. 0¾d. $\frac{9}{10}$. (28.) £672, 11s. 9½d. $\frac{1}{6}$. (29.) £8085, 1s. 11½d. $\frac{11}{12}$. (30.) £5838, 16s. 6¾d. $\frac{7}{8}$. (31.) £177, 19s. 1½d. $\frac{1}{2}$. (32.) £99, 18s. 11½d. $\frac{3}{4}$. (33.) £170, 15s. 7¾d. $\frac{1}{4}$. (34.) £4483, 2s. 8½d. $\frac{5}{6}$. (35.) £175, 15s. 10¾d. $\frac{5}{11}$. (36.) £773, 12s. 8½d. $\frac{8}{13}$. (37.) £888, 15s. 10½d. $\frac{1}{34}$. (38.) £782, 1s. 7½d. $\frac{23}{38}$. (39.) £21, 0s. 0¾d. $\frac{1}{8}$. (40.) £1, 13s. 7d. (41.) £17, 6s. 0¼d. (42.) £44, 14s. 2¾d. $\frac{1}{2}$.

XXXVIII. (1.) £4, 4s. (2.) £3, 13s. 6d. (3.) £5, 6s. 1¼d. (4.) £4, 14s. 5¾d. (5.) £62, 0s. 3d. (6.) John 2s. 5¼d., and James £1, 17s. 6¾d. (7.) 12s. 4½d. (8.) A by £2, 0s. 11½d. (9.) £49, 0s. 4½d. (10.) £3, 9s. 3½d. (11.) £41, 10s. (12.) Piano £48, 14s. 6d.; stool £1, 3s. 8d.; mat 1s. 10d.

XXXIX. (1.) *£178, 14s. 8d. (2.) *£192, 16s. 7d. (3.) *£150, 19s. 3½d. (4.) *£261, 11s. 6¾d. (5.) *£193, 14s. 2¼d. (6.) *£339, 2s. 2d. (7.) £319, 7s. 11d. (8.) £329, 8s. 11½d. (9.) £347, 19s. 10¾d. (10.) £586, 2s. 3d. (11.) £1191, 8s. 4½d. (12.) £6748, 6s. 8½d. (13.) £6743, 12s. 2d. (14.) £6929, 1s. 3d. (15.) £8977, 17s. 1d. (16.) £10744, 4s. 3¾d. (17.) £10387, 2s. 9d. (18.) £10853, 8s. 0½d. (19.) £7698, 16s. 5½d. (20.) £10760, 4s. 6d. (21.) £7890, 10s. 3½d. $\frac{1}{2}$. (22.) £5588, 11s. 3½d. $\frac{5}{7}$. (23.) £9896, 17s. 2½d. $\frac{4}{11}$. (24.) £9644, 4s. 10¾d. $\frac{1}{3}$. (25.) £7727, 5s. 4¾d. (26.) £6285, 4s. 10½d. $\frac{9}{13}$. (27.) £10611, 13s. 8½d. $\frac{7}{10}$. (28.) £10193, 16s. 11½d. $\frac{2}{7}$. (29.) £8786, 13s. 10¾d. $\frac{6}{11}$.

XL. (1.) *£948, 9s. 5d.; *£1083, 19s. 4d.; *£1219, 9s. 3d. (2.) £1478, 12s. 2¼d.; £2168, 12s. 6½d.; £2070, 1s. 0¾. (3.) £1895, 9s.; £2527, 5s. 4d.; £3474, 19s. 10d. (4.) £2421, 16s. 3¾d.; £2511, 10s. 3d.; £2242, 8s. 5½d. (5.) £2593, 11s. 10½d.; £3772, 10s.; £2750, 15s. 7½d. (6.) £3236, 7s. 3d.; £4045, 9s. 0¾d.; £4854, 10s. 10½d. (7.) £4943, 4s. 9½d.; £3774, 16s. 9d.; £4403, 19s. 6¾d. (8.) £6711, 3s. 4½d.; £5694, 6s. 6d.; £8541, 9s. 9d.

(9.) £64555, 2s. 6d.; £57382, 6s. 8d.; £72624, 10s. 3¾d. (10.) £49369, 11s. 1½d.; £68960, 13s.; £77580, 14s. 7½d. (11.) £50410, 13s. 11½d.; £62849, 14s.; £79216, 16s. 2½d. (12.) £96939, 18s.; £118482, 2s.; £129253, 4s. (13.) £47510, 13s. 6½d.; £54297, 18s. 4d.; £61085, 3s. 1½d. (14.) £89998, 19s. 2d.; £98998, 17s. 1d.; £107998, 15s. (15.) £689698, 19s. 2d.; £758668, 17s. 1d.; £827638, 15s. (16.) £24237, 3s. 2½d.; £32316, 4s. 3d.; £43088, 5s. 8d. (17.) £58115, 19s. 9d.; £92985, 11s. 7½d. ⅘; £81362, 7s. 7¾d. ⅓. (18.) £26903, 11s. 7¾d. ½. £41508, 7s. 8½d.; £69180, 12s. 9¾d. (19.) £399244, 10s. 6½d.; £651827, 15s. 11½d. ⅚; £513314, 7s. 9¾d. (20.) £643355, 18s. 8½d. ¹⁰⁄₁₁; £827171, 18s. 4¼d. ⁵⁄₁₁; £1102895, 17s. 9¾d. ⁸⁄₁₁.

XLI. (1.) *£336, 18s. 10½d.; *£440, 12s. 4½d.; *£492, 9s. 1½d. (2.) £726, 3s. 0¾d.; £915, 11s. 8½d.; £978, 14s. 6¾d. (3.) £704, 10s. 0¾d.; £780, 13s. 3¾d.; £1009, 3s. 0¾d. (4.) £1480, 14s. 9¾d.; £1632, 12s. 2¾d.; £2164, 3s. 2½d. (5.) £2344, 5s. 5½d.; £2942, 16s. 2½d.; £3042, 11s. 3¾d. (6.) £10957, 15s. 7½d.; £11969, 5s. 4½d.; £13992, 4s. 10½d. (7.) 1467, 4s. 7½d.; £1598, 12s. 5¾d.; £1949, 0s. 1¾d. (8.) 2756, 0s. 11½d.; £3115, 10s. 7½d.; £3634, 15s. 8¾d. (9.) £1728, 8s. 4½d.; £4329, 19s. 1½d.; £10103, 4s. 7½d. (10.) £4811, 1s. 7½d.; £6346, 16s. 5½d.; £7447, 13s. 3d. (11.) £6309, 3s. 9d.; £9413, 5s.; £1573, 13s. 9d. (12.) £13358, 12s. 4½d.; £13929, 3s. 3d.; £9915, 13s. 6d. (13.) £19595, 15s. 6d.; £15106, 17s. 6d.; £17372, 18s. 1½d. (14.) £89329, 7s. 11d.; £254554, 12s. 6d. (15.) £41738, 12s. 6d.; £102047, 4s. 0¾d. (16.) £62408, 3s. 8½d.; £74138, 5s. 3d. (17.) £150203, 5s. 7½d.; £216809, 1s. 3d. (18.) £131422, 19s. 4d.; £110924, 12s. 0½d. (19.) £102178, 2s. 6d.; £16217, 2s. 6¾d. (20.) £139859, 7s. 4½d.; £175977, 19s. 6d. (21.) £997, 3s. 2¾d. ⅛; £1201, 14s. 0¾d. ⅜; £1355, 2s. 3¾d. ⅝. (22.) £2146, 8s. 0¾d. ⅝; £2845, 4s. 7¾d. ⅝; £3044, 17s. 11½d. ⅞. (23.) £5339, 4s. 2½d. ¹⁄₁₁; £5812, 6s. 1¾d. ¹⁰⁄₁₁; £6420, 11s. 4½d. ⁹⁄₁₁. (24.) £32282, 16s. 10½d. ¼; £16237, 16s. 10½d. ¹¹⁄₁₂; £21059, 1s. 2¾d. ½. (25.) £32280, 13s. 9½d. ¹¹⁄₁₉; £15150, 13s. 9¾d. ¹³⁄₁₉; £32388, 13s. 0½d. ⁵⁄₁₉.

XLII. (1.) £24115, 2s. 2d. (2.) £403, 5s. (3.) £15, 12s. 8½d. (4.) £644, 9s. 3d. (5.) Gained £38, 15s. (6.) £80, 19s. 8½d. (7.) £59, 7s. 6d. (8.) £1225, 17s. 6d.

(9.) £259. (10.) £3, 10s. 10d. (11.) £2, 1s. 3d. (12.) £308, 6s. 8d.

XLIII. (1.) *£21, 9s. 3d. (2.) *£18, 7s. 4½d. (3.) *£24, 5s. 6½d. $\frac{2}{3}$. (4.) *£28, 12s. 7d. (5.) *£24, 8s. 5¾d. $\frac{1}{2}$. (6.) *£17, 7s. 4¾d. $\frac{1}{2}$. (7.) £17, 10s. 3½d. $\frac{2}{3}$. (8.) £12, 15s. 6¾d. $\frac{2}{3}$. (9.) £8, 10s. 8¼d. (10.) £8, 9s. 2½d. $\frac{1}{3}$. (11.) £10, 19s. 11¾d. $\frac{8}{9}$. (12.) £10, 19s. 9d. (13.) £61, 6s. 8½d. $\frac{7}{11}$. (14.) £81, 11s. 2¾d. $\frac{2}{3}$. (15.) £71, 14s. 7¾d. (16.) *£128, 4s. 10d. + 1½d. (17.) £58, 10s. 1½d. + 2½d. (18.) £48, 18s. 4¾d. + 1½d. (19.) £97, 12s. + ¾d. (20.) £76, 8s. 4½d. + ¾d. (21.) *£71, 19s. 0½d. $\frac{1}{24}$. (22.) £51, 5s. 4½d. $\frac{17}{66}$. (23.) £35, 2s. 5¼d. $\frac{19}{880}$. (24.) £125, 2s. 11¾d. $\frac{15}{88}$. (25.) £70, 4s. 2¼d. $\frac{7}{85}$. (26.) £88, 19s. 5½d. $\frac{61}{143}$. (27.) *£67, 0s. 8½d. + 1½d. $\frac{13}{15}$. (28.) £89, 0s. 1½d. + 2¼d. $\frac{1}{7}$. (29.) £59, 5s. 11¾d. + 2½d. $\frac{11}{12}$. (30.) £73, 13s. 8½d. + 1½d. $\frac{19}{17}$.

XLIV. (1.) *17s. 1½d. $\frac{6}{7}$; *15s. 11¾d. $\frac{1}{15}$; *14s. 11¾d. $\frac{1}{8}$. (2.) 10s. 7½d. $\frac{11}{18}$; 9s. 1¼d. $\frac{2}{3}$; 9s. 6¾d. $\frac{11}{20}$. (3.) 8s. 2¼d. $\frac{7}{11}$; 7s. 5¾d. $\frac{11}{12}$; 5s. 5¼d. $\frac{25}{55}$. (4.) 5s. 10½d. $\frac{11}{24}$; 5s. 3½d. $\frac{2}{5}$; 4s. 4¾d. $\frac{28}{88}$. (5.) 15s. 5¼d. $\frac{15}{28}$; 17s. 3½d. $\frac{2}{5}$; 13s. 5¾d. $\frac{21}{35}$. (6.) £2, 14s. 1¾d. $\frac{2}{5}$; £2, 8s 8¾d. $\frac{3}{10}$; £2, 15s. 8½d. $\frac{17}{35}$. (7.) £1, 16s. 9¾d. $\frac{27}{44}$; £1, 12s. 4¾d. $\frac{7}{10}$; £1, 7s. 0¼d. $\frac{5}{12}$. (8.) £1, 16s. 4½d. $\frac{1}{16}$; £1, 11s. 8¾d. $\frac{49}{55}$; £2, 1s. 6¾d. $\frac{3}{5}$. (9.) £16, 19s. 5½d. $\frac{11}{18}$; £13, 1s. 10½d. $\frac{9}{10}$; £13, 17s. 8¾d. $\frac{23}{25}$. (10.) £9, 17s. 7¾d. $\frac{35}{36}$; £8, 9s. 5¼d. $\frac{23}{48}$; £10, 3s. 3¾d. $\frac{2}{35}$. (11.) £14, 11s. 5¼d. $\frac{13}{21}$; £16, 7s. 10½d. $\frac{11}{56}$; £18, 14s. 8½d. $\frac{18}{49}$. (12.) £18, 13s. 11¼d. $\frac{5}{35}$; £14, 4s. 10½d. $\frac{11}{24}$; £14, 15s. 5½d. $\frac{7}{27}$. (13.) £112, 4s. 6½d. $\frac{69}{88}$; £109, 14s. 8¼d. $\frac{53}{70}$; £99, 15s. 1¾d. $\frac{80}{99}$. (14.) £79, 11s. 11¾d. $\frac{29}{72}$; £70, 15s. 1¼d. $\frac{1}{4}$; £69, 9s. 4½d. $\frac{27}{110}$. (15.) £72, 17s. 1½d. $\frac{11}{30}$; £72, 5s. 0¾d. $\frac{41}{121}$; £60, 14s. 3¾d. $\frac{17}{24}$. (16.) £51, 15s. 1¼d. $\frac{23}{132}$; £63, 5s. 1½d. $\frac{11}{108}$; £56, 9s. 2¾d. $\frac{111}{121}$. (17.) £97, 12s. 9½d. $\frac{19}{50}$; £9, 15s. 3½d. $\frac{212}{500}$; £0, 19s. 6¼d. $\frac{1712}{5000}$. (18.) £87, 12s. 11¼d. $\frac{99}{100}$; £8, 15s. 3½d. $\frac{993}{1000}$; £0, 17s. 6½d. $\frac{4029}{10000}$. (19.) £31, 18s. 3½d. $\frac{69}{200}$; £21, 5s. 6½d. $\frac{189}{300}$; £7, 1s. 10¾d. $\frac{463}{500}$. (20.) £5, 14s. 9¾d. $\frac{167}{550}$; 10s. 6¾d. $\frac{5567}{6000}$; 1s. 4½d. $\frac{14567}{16000}$. (21.) £3, 1s. 3¾d. $\frac{209}{1250}$; £2, 2s. 6½d. $\frac{1102}{1500}$; 2s. 1½d. $\frac{38209}{36000}$. (22.) *£1, 4s. 5¾d. $\frac{209}{318}$; *18s. 3¾d. $\frac{209}{288}$; *17s. 7¾d. $\frac{161}{300}$. (23.) £1, 16s. 6½d. $\frac{25}{271}$; £1, 1s. 3½d. $\frac{319}{384}$; 18s. 3¾d. $\frac{319}{384}$. (24.) £0, 18s. 7¾d. $\frac{237}{864}$; 17s. 10¾d. $\frac{811}{900}$; 16s. 7¾d. $\frac{295}{576}$. (25.) £8, 9s. 8¾d. $\frac{246}{297}$; £10, 18s. 2¾d. $\frac{179}{231}$; £4, 15s. 5¾d. $\frac{5}{33}$.

XLV. (1.) *£20, 1s. 11¾d. $\frac{3}{17}$; *£26, 5s. 8½d. $\frac{2}{13}$; *£17, 19s. 8½d. $\frac{2}{19}$. (2.) £28, 14s. 5½d. $\frac{20}{29}$; £36, 4s. 4½d. $\frac{2}{23}$; £26, 17s. 4½d. $\frac{21}{31}$. (3.) £17, 8s. 11½d. $\frac{7}{37}$; £15, 0s. 3½d. $\frac{1}{41}$; £11, 6s. 6½d. $\frac{53}{43}$. (4.) £19, 1s. 4½d. $\frac{32}{33}$; £18, 2s. 9½d. $\frac{35}{41}$; £14, 0s. 7½d. $\frac{17}{39}$. (5.) 7s. 8½d. $\frac{22}{47}$; 5s. 10¾d. $\frac{55}{61}$; 5s. 0¾d. $\frac{61}{71}$. (6.) £5, 5s. 2½d. $\frac{27}{53}$; £4, 15s. 6½d. $\frac{27}{55}$; £3, 14s. 9½d. $\frac{17}{83}$. (7.) £1, 10s. 0½d. $\frac{23}{67}$; £1, 5s. 9½d. $\frac{1}{13}$; £1, 2s. 7½d. $\frac{6}{89}$. (8.) £2, 18s. 3½d. $\frac{20}{97}$; £2, 15s. 1½d. $\frac{7}{73}$; £2, 4s. 2½d. $\frac{2}{97}$. (9.) 2½d. $\frac{68}{605}$; ½d. $\frac{25}{467}$; 1d. $\frac{411}{548}$. (10.) £3, 8s. 6½d. $\frac{249}{277}$; £1, 9s. 4½d. $\frac{533}{587}$; £2, 7s. 0½d. $\frac{52}{127}$. (11.) £2, 17s. 0½d. $\frac{2285}{3127}$; £11, 8s. 6¾d. $\frac{18}{109}$; £2, 9s. 5½d. $\frac{47}{71}$. (12.) £11, 15s. 8¾d. $\frac{102}{3916}$; £11, 6s. 4½d. $\frac{2263}{6719}$; £10, 17s. 1½d. $\frac{119}{354}$. (13.) 1s. 11½d. $\frac{1237}{4657}$; 2s. 2¾d. $\frac{13}{118}$; 2s. 6½d. $\frac{437}{709}$. (14.) 4½d. $\frac{2}{2}\frac{237}{554}$; 1½d. $\frac{4918}{5438}$. (15.) £1, 17s. 5¾d. $\frac{1785}{4785}$; £1, 0s. 6½d. $\frac{470}{1349}$. (16.) 2½d. $\frac{3603}{3950}$; 2½d. $\frac{1803}{4156}$. (17.) £4, 14s. 2½d. $\frac{7}{9}\frac{38}{106}$; £1, 3s. 5½d. $\frac{1}{13000}$. (18.) *2s. 11½d. + R £6, 2s. 8¾d.; *2s. 7¾d. + R £5, 4s. 10d. (19.) £1, 15s. 2½d. + R £3, 4s. 5½d.; £1. 0s. 3½d. + R 10s. 9¾d. (20.) 17s. 9½d. + R £4, 8s. 2d.; £1, 2s. 10½d. + R £2, 1s. 10½d. (21.) *£30, 18s. 3½d. $\frac{43}{87}$; *£24, 4s. 7½d. $\frac{34}{111}$; *£20, 17s. 0½d. $\frac{52}{129}$. (22.) £2, 0s. 10½d. $\frac{59}{215}$; £1, 13s. 1¾d. $\frac{59}{265}$; £1, 8s. 9½d. $\frac{164}{305}$. (23.) £12, 8s. 6½d. $\frac{128}{255}$; £11, 5s. 8½d. $\frac{187}{309}$; £10, 11s. 1½d. $\frac{223}{611}$. (24.) 1s. 11½d. $\frac{24553}{38888}$; 1s. 6¾d. $\frac{1730}{4779}$; 1s. 3¾d. $\frac{3512}{5664}$. (25.) 3½d. $\frac{3341}{159950}$; ½d. $\frac{53641}{127050}$. (26.) 5½d. + R £37, 18s. 5½d. $\frac{4}{13}$; 2½d. + R £67, 1s. 9½d. $\frac{4}{13}$.

XLVI. (1.) *£1, 5s. 11½d. $\frac{2}{7}$. (2.) *£11, 7s. 11½d. $\frac{4}{7}$. (3.) £15, 16s. 3½d. $\frac{2}{7}$; £15, 7s. 6½d. $\frac{5}{8}$; £22, 12s. 10½d. $\frac{3}{11}$. (4.) £28, 7s. 11½d. $\frac{4}{11}$; £35, 15s. 9½d. $\frac{6}{13}$; £15, 0s. 4½d. $\frac{7}{13}$. (5.) £490, 14s. 8½d.; £395, 19s. 5½d. (6.) £1308, 9s. 2½d.; £1399, 18s. 8d. (7.) £879, 2s. 7d.; £984, 14s. 9½d. $\frac{2}{7}$. (8.) £2402, 18s. 1½d.; £2594, 13s. 9d. (9.) £6347, 8s. 6d.; £8017, 16s. 0d. (10.) £9350, 14s. 9d.; £15930, 17s. 8½d. $\frac{2}{3}$. (11.) £2859, 15s. 11¼d.; £2673, 13s. 1½d. (12.) £7960, 18s. 0½d. $\frac{2}{3}$; £8387, 5s. 8d. (13.) £3462, 17s. 5d.; £5777, 6s. 9¾d. (14.) £10949, 8s. 0d.; £12178, 1s. 11½d. (15.) £14696, 12s. 7½d.; £27654, 10s. 1d. (16.) £25443, 15s. 7d.; £44726, 8s. 11½d. (17.) £7596, 6s. 3d.; £9484, 18s. 11¾d. (18.) £682210, 17s. 6½d. $\frac{6}{17}$; £1026588, 12s. 8½d. $\frac{14}{15}$. (19.) £648, 19s. 10½d. $\frac{7}{15}$; £1089, 1s. 1½d. $\frac{16}{35}$. (20.) £2799, 11s. 11½d. $\frac{20}{63}$; £33719, 14s. 0½d. $\frac{6}{11}$.

XLVII. (1.) *£87, 1s. 9½d.; *£83, 12s. 1½d. $\frac{4}{5}$; *£81, 5s.

$7\frac{3}{4}$d. $\frac{1}{3}$. (2.) £23, 17s. $5\frac{1}{2}$d. $\frac{1}{7}$; £22, 13s. $10\frac{3}{4}$d. $\frac{1}{3}$; £20, 5s. $1\frac{1}{2}$d. $\frac{6}{11}$. (3.) £2, 19s. $2\frac{3}{4}$d. $\frac{5}{11}$; £2, 1s. $2\frac{1}{2}$d. $\frac{11}{47}$. (4.) £1, 1s. $9\frac{3}{4}$d. $\frac{7}{44}$; 19s. $5\frac{1}{4}$d. $\frac{1}{13}$. (5.) £1, 16s. $5\frac{1}{2}$d. $\frac{17}{47}$; £1, 13s. $2\frac{1}{4}$d. $\frac{53}{83}$. (6.) £12, 10s. $1\frac{1}{4}$d. $\frac{1}{7}$; £13, 9s. $11\frac{1}{2}$d. $\frac{88}{107}$. (7.) £72, 3s. $8\frac{3}{4}$d. $\frac{13}{76}$; £58, 4s. $9\frac{1}{4}$d. $\frac{21}{118}$. (8.) *£62, 6s. $7\frac{1}{2}$d. + R $\frac{3}{4}$d. $\frac{6}{7}$; *£59, 12s. $10\frac{3}{4}$d. + R $1\frac{1}{2}$d. $\frac{10}{11}$. (9.) £43, 0s. $0\frac{1}{4}$d. + R 4d.; £38, 15s. $10\frac{1}{4}$d. + R $\frac{1}{2}$d. $\frac{1}{3}$. (10.) £47, 2s. $0\frac{3}{4}$d. + R $3\frac{3}{4}$d. $\frac{3}{5}$; £38, 12s. $3\frac{1}{4}$ + R $6\frac{1}{4}$d. $\frac{3}{5}$. (11.) £28, 0s. $1\frac{3}{4}$d. + R $\frac{3}{4}$d. $\frac{1}{6}$; £18, 13s. $0\frac{1}{4}$d. + R $11\frac{1}{4}$d. (12.) £43, 10s. $11\frac{1}{4}$d. $1\frac{2}{3}$; £48, 9s. $5\frac{1}{4}$d. $\frac{13}{17}$. (13.) £22, 16s. $1\frac{1}{2}$d. $\frac{238}{337}$; £12, 8s. $9\frac{1}{4}$d. $\frac{213}{800}$. (14.) £18, 9s. $6\frac{3}{4}$d. + R $3\frac{1}{4}$d. $\frac{5}{7}$; £15, 15s. $2\frac{1}{2}$d. + R $8\frac{1}{4}$d. $\frac{5}{7}$. (15.) £89, 2s. $4\frac{1}{2}$d. + R $7\frac{3}{4}$d. $\frac{59}{77}$; £8, 19s. $4\frac{1}{4}$d. + R 15s. $10\frac{1}{2}$d. $\frac{23}{84}$.

XLVIII. (1.) *$\frac{3}{4}$d. $\frac{1}{3}$; $\frac{3}{4}$d. $\frac{3}{7}$; $\frac{1}{2}$d. $\frac{3}{5}$. (2.) $8\frac{1}{2}$d. $\frac{2}{7}$; $10\frac{1}{2}$d. $\frac{2}{3}$; $3\frac{1}{4}$d. $\frac{1}{11}$. (3.) *17s. $1\frac{1}{2}$d. $\frac{6}{7}$; 14s. $6\frac{1}{2}$d. $\frac{2}{11}$; 13s. $10\frac{3}{4}$d. $\frac{8}{13}$. (4.) £2, 8s. $6\frac{3}{4}$d. $\frac{3}{5}$; £4, 16s. 8d.; £6, 7s. $3\frac{1}{4}$d. $\frac{1}{11}$. (5.) 18s.; 8s. $4\frac{3}{4}$d. $\frac{1}{3}$; 1s. $0\frac{3}{4}$d. $\frac{3}{5}$. (6.) 10s. $10\frac{3}{4}$d. $\frac{7}{11}$; 10s.; £3, 5s. 4d. (7.) £20771, 5s. (8.) £29261, 2s. $0\frac{1}{2}$d. $\frac{3}{5}$. (9.) £131, 17s. $7\frac{1}{2}$d. $\frac{4}{11}$. (10.) £799, 1s. $5\frac{3}{4}$d. $\frac{4}{7}$. (11.) £14, 17s. 3d. (12.) $17\frac{1}{2}$s. $4\frac{1}{2}$d. $\frac{6}{13}$. (13.) £15963, 1s. $3\frac{1}{2}$d. $\frac{5}{7}$; £42076. (14.) £9, 14s. $5\frac{1}{4}$d. $\frac{1}{3}$; 12s. 6d. (15.) 1s. $8\frac{1}{4}$d. $\frac{9}{11}$; £1, 13s. 10d. (16.) 5s. $0\frac{1}{4}$d. $\frac{27}{55}$; 15s. $1\frac{1}{4}$d. $\frac{25}{27}$. (17.) £6, 0s. $3\frac{3}{4}$d. $\frac{75}{187}$. (18.) 2s. $7\frac{1}{2}$d. $\frac{83}{531}$. (19.) *6s. $7\frac{1}{2}$d. (20.) £1, 9s. 7d. (21.) £1, 2s. $9\frac{3}{4}$d. $\frac{13}{19}$. (22.) 10s. $10\frac{3}{4}$d. $\frac{1}{3}$.

XLIX. (1.) *1630$\frac{3}{4}$s.; *7142$\frac{5}{8}$s.; *3189$\frac{1}{2}$ sixpences. (2.) $305\frac{3}{4}$ half-crowns; $183\frac{7}{20}$ half-sovereigns; £4382191$\frac{3}{8}$. (3.) £490707$\frac{1}{8}$; 63734$\frac{1}{8}$s.; 56763$\frac{1}{8}$s. (4.) 930$\frac{1}{8}$ guineas; £1025$\frac{13}{20}$; 235$\frac{29}{42}$ half-guineas. (5.) *10d.; *48d.; *204d. (6.) 213$\frac{1}{10}$d.; 216d.; 75$\frac{3}{4}$d. (7.) 11$\frac{7}{8}$s.; 15$\frac{3}{4}$s.; 1$\frac{7}{8}$s. (8.) 11$\frac{2}{3}$s.; 15$\frac{3}{4}$s.; 1$\frac{7}{8}$s. (9.) 174$\frac{6}{11}$ threepenny-bits; 336f.; 518 half-pence. (10.) *$\frac{1}{15}$, *$\frac{1}{36}$, *$\frac{1}{72}$. (11.) $\frac{1}{80}$, $\frac{1}{24}$, $\frac{2}{45}$. (12.) $\frac{1}{6}$, $\frac{1}{24}$, $\frac{1}{28}$. (13.) $\frac{2}{5}$, $\frac{1}{2}$, $\frac{3}{8}$. (14.) $\frac{111}{37}$, $\frac{13}{60}$, $\frac{2}{3}$. (15.) $\frac{4}{35}$, $\frac{100}{231}$, $\frac{4}{15}$.

L. (1.) £31, 15s. $2\frac{1}{4}$d. $\frac{3}{5}$. (2.) 53. (3.) £35, 17s. $7\frac{3}{4}$d. (4.) 6s. 10d. (5.) £73, 3s. 1d. (6.) £5, 9s. $11\frac{1}{2}$d. and £4, 10s. (7.) Man's share £3, 4s.; woman's 16s.; boy's 5s. 4d. (8.) 5s. (9.) $4\frac{1}{2}$d. (10.) 2s. $4\frac{3}{4}$d. (2s. $4\frac{1}{2}$d. $\frac{14}{35}$). (11.) 6 gallons. (12.) 25 lbs. at 3s. per lb.

LI. (1.) *£635, *£1270, *£3175. (2.) *£360, *£240, *£180. (3.) *£170, 4s.; *£141, 16s. 8d.; *£70, 18s. 4d.

(4.) £121, 5s.; £97; £323, 6s. 8d. (5.) £223, 13s. 4d.; £134, 4s.; £111, 16s. 8d. (6.) £180, 15s.; £90, 7s. 6d.; £60, 5s. (7.) £85, 2s.; £141, 16s. 8d.; £283, 13s. 4d. (8.) £1279, 10s.; £1919, 5s.; £3582, 12s. (9.) £2848; £4524, 3s. 4d.; £5488, 6s. 8d. (10.) £3263; £5396, 10s.; £6871, 2s. 6d. (11.) £2864; £1163, 10s.; £3826, 2s. 6d. (12.) £7237, 8s. 4d.; £7901, 6s.; £6094, 13s. 4d. (13.) £37, 2s.; £111, 6s.; £259, 14s. (14.) £17, 9s. 6d.; £11. 13s.; £8, 14s. 9d. (15.) £7, 8s. 6d.; £3, 14s. 3d.; £5, 11s. 4½d. (16.) £12, 1s. 4d.; £4, 10s. 6d.; £9, 1s. (17.) £48, 1s. 4d.; £42, 1s. 2d.; £40, 11s. 1½d. (18.) £97, 6s.; £145, 19s.; £215, 9s. (19.) £346, 5s. 6d.; £461, 14s.; £400, 19s. (20.) £1, 17s. 5½d.; £4, 13s. 7¾d.: £5, 12s. 4½d. (21.) £31, 15s. 10d.; £22, 5s. 1d.; £15, 17s. 11d. (22.) £10, 8s.; £12, 2s. 8d.; £19, 1s. 4d. (23.) *£520, 10s.; *£462, 13s. 4d.; *£433, 15s. (24.) *£490, 1s.; *£534, 12s.; *£501, 3s. 9d. (25.) *£445, 1s. 8d.; *£635, 16s. 8d.; *£413, 5s. 10d. (26.) *£2287 7s.; *£3363, 15s.; *£4148, 12s. 6d. (27.) *£2404, 8s. 4d.; *£1901, 3s. 4d.; *£3047, 9s. 2d. (28.) £2189, 4s.; £2999, 12s. 6d.; £3017, 3s. 4d. (29.) £389, 1s. 8d.; £547, 8s.; £704, 7s. 6d. (30.) £1080, 14s.; £742, 6s. 3d.; £1059, 6s. (31.) £2445, 14s. 2d.; £3180, 19s. 4½d.; £2433, 6s. 6d. (32.) £1955, 3s. 9d.; £2762, 7s. 6d.; £1883, 8s. 9d. (33.) £3024, 11s.; £1581, 11s. 3d.; £3004, 19s. 4½d. (34.) £3440, 7s.; £2607, 17s. 11d.; £944, 14s. 3½d. (35.) £1543, 7s. 9¾d.; £2260, 12s. 8½d.; £826, 2s. 11d. (36.) £1350, 9s. 4½d.; £1980, 13s. 9d.; £695, 7s. 9¾d. (37.) £3022, 2s. 1d.; £2277, 0s. 3d.; £1534, 4s. 9¾d. (38.) £1615, 15s.; £2297, 3s. 6d.; £2683, 11s. (39.) £2110, 17s. 1d.; £2793, 0s. 9d.; £1495, 15s. 5d. (40.) £1720, 19s.; £2361, 19s. 6d.; £3072, 6s. (41.) £1868, 4s. 7d.; £1412, 4s. 9½d.; £1825, 14s. 7d. (42.) £2745, 13s. 9d.; £3633, 19s. 5d.; £1920, 11s. 9d. (43.) £2521, 4s. 11½d.; £3360, 9s. 11d.; £2515, 19s. 10d. (44.) £1437, 16s.; £1055, 12s.; £1383, 4s. (45.) £1854, 0s. 10½d.; £2594, 5s. 5½d.; £1669, 11s. 3¾d. (46.) £1925, 6s.; £2574, 13s.; £3225, 19s. (47.) £1883, 9s. 4d.; £2838, 5s. 4d.; £2239, 1s. 4d. (48.) *£2760, 7s. 6d.; *£3197, 6s. 10½d. (49.) £3121, 17s. 6d.; £1902, 5s. (50.) £1790, 8s.; £4299, 11s. 4½d. (51.) £1411, 8s. 6¾d. $\frac{3}{7}$; £3275, 14s 2¾d. $\frac{7}{11}$. (52.) £2499, 2s. 10½d. $\frac{2}{3}$; £1956, 13s. 9¾d. $\frac{7}{11}$.

LII.

(1.) *

£	s.	d.
0	4	$9\frac{1}{2}$
0	3	3
0	6	6
0	5	3
0	4	2
0	2	4
£1	6	$3\frac{1}{2}$

(2.)

£	s.	d.
0	17	6
0	3	0
0	2	$10\frac{1}{2}$
0	3	4
0	1	8
0	5	$6\frac{1}{2}$
£1	13	11

(3.)

£	s.	d.
9	9	0
0	15	8
0	7	$9\frac{1}{2}$
27	15	10
2	3	0
6	9	0
£47	0	$3\frac{1}{2}$

(4.)

£	s.	d.
20	5	0
37	19	0
0	19	3
1	9	3
2	6	3
2	16	3
£65	15	0

(5.)

£	s.	d.
0	19	4
0	15	0
0	6	9
1	16	0
0	5	3
0	2	8
£4	5	0
Dis.	4	3
£4	0	9

(6.)

£	s.	d.
0	6	0
0	14	7
0	8	9
3	2	6
4	16	0
£9	7	10

(7.)

£	s.	d.
13	1	3
1	1	$10\frac{1}{2}$
0	11	3
1	11	6
1	3	$7\frac{1}{2}$
1	0	10
£18	10	4

(8.)

£	s.	d.
0	13	$1\frac{1}{2}$
1	15	5
3	0	0
1	2	$11\frac{1}{2}$
1	19	$4\frac{1}{2}$
0	11	4
£9	2	$2\frac{1}{2}$

(9.)

£	s.	d.
0	9	4
0	4	$9\frac{3}{4}$
0	6	$8\frac{1}{2}$
0	3	0
0	9	9
£1	13	$7\frac{1}{4}$

(10.)

£	s.	d.
18	2	6
5	3	6
0	1	$10\frac{1}{2}$
9	0	0
2	14	8
3	12	0
£38	14	$6\frac{1}{2}$

(11.)

£	s.	d.
0	17	6
0	9	0
0	8	3
0	15	9
0	17	5
0	9	0
£3	16	11

(12.)

£	s.	d.
9	2	0
19	12	6
4	19	0
4	10	0
1	18	0
1	0	10
£41	2	4

LIII. (1.) 3 : 4, 2 : 5, 1 : 2, 1 : 3. (2.) *15 : 26, 11 : 15, 35 : 34, 603 : 728. (3.) *14 : 19, 3 : 4, 6 : 11, 23 : 40. (4.) 6 : 7, 11 : 12, 8 : 7, $9\frac{1}{3}$: $10\frac{1}{2}$. (5.) 8 : 9. (6.) 7 : 3. (7.) 11 : 9, 9 : 11. (8.) 3 : 2. (9.) 15 : 19.

LIV. (1.) No, 15, $2\frac{2}{3}$, $5\frac{5}{8}$, $4\frac{4}{5}$. (2.) 4. (3.) 54. (4.) $6\frac{3}{4}$. (5.) 15. (6.) *9. (7.) 27. (8.) 6. (9.) $17\frac{1}{2}$. (10.) $33\frac{9}{17}$. (11.) 57. (12.) $7\frac{1}{5}$. (13.) 18. (14.) 100. (15.) $61\frac{2}{3}$. (16.) $16\frac{2}{3}$. (17.) *7. (18.) *54. (19.) 14. (20.) 168. (21.) $25\frac{1}{2}$. (22.) 32. (23.) 4. (24.) 84. (25.) 84. (26.) $33\frac{3}{5}$. (27.) $\frac{9}{28}$. (28.) 1. (29.) $\frac{8}{15}$. (30.) $\frac{9}{20}$. (31.) $13\frac{1}{2}$. (32.) $19\frac{1}{2}$. (33.) $2\frac{2}{7}$. (34.) $13\frac{1}{4}$. (35.) $1\frac{3}{4}$. (36.) $\frac{3}{8}$. (37.) $*17\frac{151}{353}$. (38.) $4\frac{8}{9}$. (39.) $133\frac{58}{59}$. (40.) $12\frac{286}{707}$. (41.) *£13, 10s. (42.) £1, 8s. 9d. (43.) £2, 6s. (44.) £8. (45.) £2, 17s. 10d. (46.) £5, 2s. $2\frac{1}{2}$d. $\frac{2}{3}$. (47.) $*5\frac{7}{25}$. (48.) 68. (49.) $8\frac{83}{101}$. (50.) *£3, 7s. 6d. (51.) £5, 15s. (52.) £2, 18s. $11\frac{1}{4}$d. $\frac{237}{239}$. (53.) 3s. (54.) 17s. $0\frac{3}{4}$d. $\frac{1}{21}$. (55.) £3, 18s. $1\frac{9}{4}$d. $\frac{4}{27}$.

LV. (1.) *£2, 17s. (2.) *£1, 2s. (3.) £7, 15s. (4.) £72. (5.) £8. (6.) 12s. (7.) £5, 17s. 4d. (8.) 8s. (9.) £3, 6s. (10.) 374 miles. (11.) 63 days. (12.) $64\frac{2}{3}$ days. (13.) 24 men. (14.) 32. (15.) £6, 13s. 4d. (16.) 17. (17.) $88\frac{7}{11}$ yards. (18.) 100. (19.) $6\frac{1}{2}$ days. (20.) 4s. (21.) £1, 6s. 3d. (22.) 19s. 7d. : 19s. 6d. : : £470 : £468. (23.) £456. (24.) £49500. (25.) $3\frac{1}{2}$d. (26.) £2779, 13s. $10\frac{1}{2}$d. (27.) 5s. $7\frac{1}{2}$d. (28.) £221, 16s. 3d. (29.) £12, 6s. 8d. (30.) £32, 10s. (31.) £9, 7s. $10\frac{1}{2}$d.; £35, 2s. $8\frac{9}{4}$d. $\frac{2}{7}$; £3, 7s. $4\frac{1}{4}$d. $\frac{77}{80}$. (32.) £3. (33.) 7s. 6d. (34.) 10s. (35.) £18. (36.) 8s. $4\frac{3}{4}$d. $\frac{1}{5}$. (37.) 10s. $9\frac{1}{2}$d. $\frac{2}{5}$. (38.) 1s. $0\frac{1}{4}$d. (39.) £126, 15s. $6\frac{1}{2}$d. $\frac{2}{3}$. (40.) 16 men.

LVI. (1.) *£280, 16s. (2.) 5 weeks. (3.) 560 acres. (4.) 18. (5.) £1, 1s. 8d. (6.) 270 miles. (7.) $3\frac{1}{9}$ weeks. (8.) 9d. (9.) £666, 13s. 4d. (10.) £1, 5s. (11.) £2730. (12.) 16 tons. (13.) £69, 16s. 6d. (14.) 16 months. (15.) $13\frac{1}{2}$ months. (16.) £3, 15s. $6\frac{1}{2}$d. $\frac{2}{5}$. (17.) 13s. $2\frac{1}{4}$d. $\frac{1}{3}$. (18.) 2 men. (19.) £41, 2s. $11\frac{1}{2}$d. $\frac{2}{25}$. (20.) £68, 18s. $1\frac{3}{4}$d. $\frac{4}{5}$; £146, 3s. $9\frac{9}{4}$d. $\frac{183}{200}$; £3, 1s. $1\frac{1}{2}$d.; £15, 9s. $11\frac{9}{4}$d. $\frac{284}{365}$.

LVII. (1.) 61203. (2.) £582, 1s. $7\frac{1}{4}$d. $\frac{3}{5}$. (3.) 7. (4.) Horse £37, 15s.; cart £12, 10s.; harness £3, 10s. (5.) 19. (6.) 133. (7.) 4s. 6d. (8.) $1\frac{1}{2}$d. $\frac{2}{3}$. (9.) $\frac{4}{5}$. (10.) $1\frac{8}{27}$. (11.) $\frac{5}{24}$, $1\frac{3}{15}$. (12.) 5s. $7\frac{1}{2}$d. (13.) £7, 18s. $5\frac{3}{4}$d. + R $6\frac{1}{4}$d. (14.) 15 times. (15.) $9\frac{3}{5}$ times. (16.) 12s. $1\frac{3}{4}$d. $\frac{7}{15}$. (17.) £1317, 0s. $1\frac{1}{4}$d. (18.) 1d. (19.) £38, 5s.; £25, 10s. (20.) 11s. $3\frac{9}{4}$d. $\frac{4}{15}$. (21.) 13. (22.) $\frac{3}{16}$. (23.)

£1. 1s. 7$\frac{9}{11}$d. $\frac{4}{21}$. (24.) $\frac{2}{11}$. (25.) 8s. 6$\frac{3}{4}$d. (26.) 1$\frac{1}{65}$. (27.) $\frac{4}{5}$, 18$\frac{1}{16}$, 450$\frac{7}{27}$. (28.) 1211$\frac{1}{25}$, 7$\frac{1}{2}$. (29.) £12, 8s. 10$\frac{1}{3}$d. $\frac{2}{3}$. (30.) $\frac{2}{21}$. (31.) 7$\frac{1}{6}$ days. (32.) 2$\frac{1}{4}$ days. (33.) 2$\frac{2}{55}$. (34.) 6$\frac{1}{2}$. (35.) 3$\frac{1}{2}$ days. (36.) $\frac{4}{21}$. (37.) $\frac{7}{24}$. (38.) 1$\frac{1}{3}$ days. (39.) $\frac{1}{14}$. (40.) 38 minutes. (41.) 66 men. (42.) 36. (43.) £352, 12s. 6d. (44.) £79, 3s. 4d. (45.) 2. (46.) $\frac{2}{3}$. (47.) £32470, 4s. (48.) 320. (49.) 5$\frac{1}{16}$ days. (50.) 18$\frac{3}{4}$ days. (51.) 11 cwt. of each. (52.) 9d. (53.) A 13s. 0$\frac{3}{4}$d.; B 17s. 5d.; C and D each £1, 1s. 9$\frac{1}{2}$d. ∵ If B pay four parts, A must pay three, and C and D each 5 parts. (54.) 10 parts, and 10d. over. (55.) £1, 8s.; 19s. (56.) £4, 14s. 6d.; £1, 2s. 6d. (57.) £2009, 10s. 9$\frac{2}{11}$d. $\frac{2}{11}$. (58.) £2522, 14s. 9$\frac{3}{4}$d. $\frac{5}{11}$. (59.) £52, 17s. 0$\frac{3}{4}$d. (60.) £72, 11s. 10$\frac{9}{4}$d. $\frac{3}{8}$. (61.) £2450. (62.) $\frac{89}{105}$. (63.) 3$\frac{7}{20}$. (64.) 59$\frac{11}{21}$. (65.) 30 days. (66.) 19s. 3d. (67.) 1 man. (68.) 1$\frac{1}{8}$ hours. (69.) 1$\frac{1}{4}$d. (70.) $\frac{18}{37}$. (71.) $\frac{3}{14}$. (72.) As 33, 20, 40. (73.) As 70, 18, 21. (74.) Price of a sheep = £2, 5s., $\frac{\text{£2, 5s.} \times 3}{5}$ = 27s. = price of a pig, ∴ $\frac{\text{£18} - \text{£1, 7s.} \times 11}{18}$ = 3s. 6d. = price of a hen. (75.) 6d. (76.) Man £8, woman £3, child £1. (77.) 60 oranges are worth 30d., ∴ $\frac{30}{40}$d. × 24 = 1s. 6d. (78.) £12. (79.) 5 miles. (80.) £154, 14s. 5$\frac{1}{4}$d. (81.) £181, 10s. 9$\frac{9}{11}$d. $\frac{12}{13}$. (82.) 72 days. (83.) £74391, 14s. 10$\frac{3}{4}$d. (84.) 10$\frac{7}{8}$ days. (85.) A's £2, 14s.; B's £1, 4s. (86.) $\frac{12}{31}$. (87.) 217. (88.) 3. (89.) 1. (90.) 7. (91.) 2. (92.) 3. (93.) $\frac{1}{10}$.

WEIGHTS AND MEASURES, DECIMAL FRACTIONS, PERCENTAGES, &c.

LVIII. (1.) *521 lbs. ; *7613 drs. (2.) 4118363 drs. ; 1232137 drs. (3.) 4123056 drs. ; 54717 drs. (4.) *5 cwts. 1 lb. ; *2 tons 4 cwts. 1 qr. 19 lbs. 11 oz. (5.) 12 tons 3 cwts. 2 qrs. 11 lbs. 7 oz. 7 drs. ; 15 tons 13 cwts. 8 lbs. 1 oz. 1 dr. (6.) 13 tons 6 cwts. 2 qrs. 10 lbs. 10 oz. 11 drs. ; 9 cwts. 1 qr. 25 lbs. 11 oz. $296\frac{1}{2}$ grs. (7.) 1298 tons 2 cwts. 105 lbs. 13 oz. (8.) 12 tons 11 cwts. 1 qr. 7 lbs. 7 oz. 8 drs. (9.) 15 tons 1 cwt. 28 lbs. 1 oz. 3 drs. (10.) 1 ton 15 cwts. 20 lbs. 2 oz. 15 drs. (11.) 2 cwts. 2 qrs. 26 lbs. 1 oz. 13 drs. (12.) 106 lbs. 3 oz. $423\frac{1}{2}$ grs. (13.) 32 tons 7 cwts. 3 qrs. 25 lbs. 7 oz. 8 drs. (14.) 30 tons 3 cwts. 2 qrs. 10 lbs. 15 oz. (15.) 214 tons 14 cwts. 1 qr. 4 lbs. (16.) 1583 tons 10 cwts. 23 lbs. (17.) 5 cwts. 81 lbs. 7 oz. $2\frac{10}{11}$ drs. (18.) 2 cwts. 1 qr. 9 lbs. 1 oz. $12\frac{4}{5}$ drs. (19.) 1 cwt. 2 qrs. 18 lbs. 11 oz. $11\frac{10}{49}$ drs. (20.) 21 lbs. $12\frac{10}{11}\frac{8}{9}$ drs. (21.) 102 lbs. 11 oz. 14 drs. + R 15 oz. 14 drs. (22.) 98 tons 19 cwts. 25 lbs. 11 oz. $9\frac{2}{3}$ drs. (23.) 273 tons 13 cwts. 3 qrs. 2 lbs. 6 oz. $2\frac{3}{5}$ drs. (24.) 4 cwts. 2 qrs. 5 lbs. 7 oz. $12\frac{25}{33}$ drs. (25.) 2 cwts. 1 qr. 16 lbs. 13 oz. 8 drs. + R 1 oz. 11 drs. (26.) $13\frac{27}{28}$ cwts. ; $54\frac{32}{67}$ lbs. (27.) $47\frac{10}{11}\frac{9}{3}$ qrs. ; $125\frac{73}{112}$ cwts. (28.) $\frac{1}{8}$; $\frac{1}{49}$. (29.) *$\frac{1}{8}$. (30.) $\frac{1}{3}$. (31.) $\frac{1}{4}$. (32.) $814\frac{6}{11}$ lbs. ; 24576 drs. (33.) $\frac{8}{125}$; $\frac{3}{3125}$. (34.) *7 oz. $1\frac{7}{8}$ drs. ; 9 cwts. 10 lbs. 2 oz. $14\frac{6}{11}$ drs. (35.) 1 cwt. 1 qr. 4 lbs. ; 10 lbs. 2 oz. $14\frac{6}{11}$ drs. (36.) 13 tons 19 cwts. 1 qr. 4 lbs. 8 oz. (37.) 4 tons 13 cwts. 3 qrs. 15 lbs. 14 oz. 8 drs. (38.) 17 cwts. 16 lbs. 8 oz. 13 drs. $26\frac{12}{33}$ grs. (39.) 270 tons 15 cwts. 2 qrs. 24 lbs. (40.) 9 cwts. 0 qrs. 23 lbs. 8 oz. 10 drs. (41.) 4 cwts. 39 lbs. 5 oz. 8 drs. (42.) 476 tons 7 cwts. 1 qr. 25 lbs 4 oz.

(43.) 561 tons 1 qr. 9 lbs. 5 oz. $5\frac{1}{2}$ drs. (44.) *£3, 16s. $4\frac{1}{2}$d. (45.) *£16, 6s. $4\frac{1}{2}$d. (46.) £11, 3s. $7\frac{1}{2}$d. $\frac{1}{8}$. (47.) £13, 8s. 4d. (48.) £6, 1s. $9\frac{1}{2}$d. $\frac{4}{7}$. (49.) £37, 2s. $8\frac{1}{2}$d. (50.) £8, 2s. $3\frac{1}{2}$d. (51.) £25, 10s. $11\frac{1}{2}$d. $\frac{4}{5}$. (52.) £6, 4s. $10\frac{9}{2}$d. $\frac{3}{5}$. (53.) £32, 2s. $9\frac{3}{4}$d. $\frac{3}{7}$. (54.) £4, 10s. $11\frac{3}{4}$d. $\frac{1}{8}$. (55.) £86, 12s. $0\frac{3}{4}$d. (56.) 66 cwts. (57.) 29 cwts. 1 qr. (58.) 15 cwts. 1 qr. 8 lbs. (59.) 29 cwts. 3 qrs. $24\frac{1}{3}$ lbs. (60.) 5 cwts. 9 oz. $3\frac{9}{13}$ drs. (61.) 9 cwts. 3 qrs. 26 lbs. 1 oz. $3\frac{9}{13}$ drs. (62.) *25 : 41, 16 : 21, 2 : 3, 27 : 20. (63.) *£3, 18s. $10\frac{3}{4}$d. $\frac{19}{20}$. (64.) £2, 15s. $1\frac{1}{2}$d. $\frac{10}{29}$. (65.) 7 cwts. 66 lbs. 8 oz. (66.) 4 lbs. 2 oz. $7\frac{1}{2}$ drs. (67.) 10 lbs. 2 oz. $8\frac{16}{25}$ drs. (68.) 11s. $6\frac{2}{3}$d. $\frac{13}{16}$. (69.) 1845 oz. 35055 far., and $\frac{3\,5\,0\,5\,5}{1\,8\,4\,5}$ = 19. (70.) 5 cwts. 9 lbs. 7 oz. (71.) £8, 7s. 6d. (72.) $5\frac{1}{2}$ drs. (73.) £7. (74.) £12, 17s. $1\frac{1}{2}$d. $\frac{2}{5}$. (75.) £275, 12s. 6d. (76.) £104, 18s. $9\frac{1}{2}$d. $\frac{2}{3}$. (77.) $5\frac{3}{8}$ lbs. (78.) 5 tons $4\frac{1}{6}$ cwts. (79.) $209\frac{11}{21}$ lbs. (80.) 3 cwts. 63 lbs. 9 oz. $9\frac{3}{8}$ drs. (81.) 3 lbs. 7 oz. $\frac{5}{8}$ dr.

LIX. (1.) *166 oz. 6 dwts. 21 grs. (2.) 17146 lbs. 9 oz. 8 dwts. 17 grs. (3.) 21593 grs. (4.) 29219 grs. (5.) 111 lbs. 9 oz. 10 dwts. (6.) 2 lbs. 1 oz. 18 dwts. 21 grs. (7.) 34 lbs. 5 oz. 16 dwts. 2 grs. (8.) 9 oz. 17 dwts. 22 grs. (9.) 142 lbs. 9 oz. 16 dwts. 3 grs. (10.) 206 lbs. 6 oz. 12 dwts. $14\frac{2}{5}$ grs. (11.) 2 oz. 17 dwts. $5\frac{164}{239}$ grs. (12.) $\frac{3}{8}$, $\frac{6}{7}$. (13.) $1\frac{139}{360}$ lbs. (14.) $\frac{2}{27}$. (15.) $\frac{29}{33}$. (16.) $\frac{7}{15}$. (17.) 9 oz. 12 dwts. (18.) 10 oz. 13 dwts. 8 grs. (19.) 1 lb. 9 oz. (20.) 4 lbs. 1 oz. 13 dwts. 12 grs. (21.) 6 oz. 18 dwts. 16 grs. + R 1 dwt. 5 grs. (22.) £3, 5s. $7\frac{3}{4}$d. (23.) £7, 16s. $4\frac{1}{2}$d. (24.) £9, 1s. $6\frac{1}{4}$d. $\frac{5}{6}$. (25.) 4 : 3, 153 : 154. (26.) £8, 10s. (27.) £15, 4s. $8\frac{1}{4}$d. (28.) $8228\frac{4}{7}$ lbs. av. (29.) $123\frac{171}{6\,2\,5}$ grs. (30.) $13\frac{3\,9}{1\,7\,5}$ oz. av. (31.) 2 oz. 3 dwts. 12 grs. (32.) $123\frac{171}{6\,2\,5}$ grs. $113\frac{1}{6\,2\,5}$ grs. (33.) £13, 19s. $2\frac{3}{4}$d. $\frac{147}{151}$. (34.) £11, 15s. $7\frac{1}{2}$d. (35.) £4, 10s. (36.) £33. (37.) 3 dwts. $15\frac{8}{11}$ grs. ; $80\frac{8}{11}$ grs.

LX. (1.) 2 oz. 3 drs. 1 scr. 14 grs. (2.) 719 grs. (3.) 1867 oz. 4 drs. 2 scrs. 17 grs. (4.) 2498 grs. (5.) 7 lbs. 10 oz. 1 dr. 2 scrs. $5\frac{5}{7}$ grs. (6.) 1 dr. 1 scr. $14\frac{11}{15}$ grs. (7.) 1 dr. 1 scr. 12 grs. + R $17\frac{3}{5}$ grs. (8.) $\frac{5}{3\,1\,5}$. (9.) 3 drs. 1 scr. $13\frac{1}{3}$ grs. (10.) 18 oz. $\frac{1}{1\,2}$ gr. (11.) 4s. $1\frac{1}{2}$d. (12.) 18s. $1\frac{1}{2}$d. (13.) $\frac{3}{4}$. (14.) 17 : 19. (15.) 7s. $5\frac{1}{4}$d. $\frac{4}{2\,1}$. (16.) $32\frac{31}{32}$ grs. (17.) $42\frac{8}{15}$ pills. (18.) ʒxiv. ʒiij. ℈ij. gr. xiv. (19.) 2 oz. 7 drs. 1 scr. $11\frac{13}{17}$ grs. (20.) 1s. $6\frac{3}{4}$d. $\frac{5}{7}$.

LXI. (1.) 63 gals. 2 qts. 1 pt. (2.) 1 gal. 1 qt. 1 pt. 3 gills. (3.) 97 gals. 1 qt. 1 pt. $3\frac{3}{4}$ gills. (4.) 1 gal. 1 qt. 1 pt. $1\frac{15}{119}$ gills. (5.) 127 gills. (6.) 955 qts. 1 pt. 1 gill. (7.) 190 gals. 1 qt. $\frac{3}{4}$ gill. (8.) 5 gals. $1\frac{3}{16}$ pts. (9.) 335 gals. $\frac{1}{2}$ pt. (10.) 3 qts. 1 pt. 1 gill + R 1 qt. 1 pt. $1\frac{3}{4}$ gills. (11.) 1 qt. 1 pt. $1\frac{1}{27}$ gill. (12.) $51\frac{3}{4}$ pts. (13.) $\frac{3}{4}$. (14.) 56 : 43. (15.) 1 gal. 1 qt. $2\frac{2}{3}\frac{2}{5}$ gills, £2, 14s. (16.) £3, 7s. $9\frac{3}{4}$d. (17.) 7s. 11d. (18.) £17, 9s. $1\frac{1}{2}$d. (19.) £3, 6s. $5\frac{1}{2}$d. (20.) $82\frac{3}{7}$ days. (21.) £6, 0s. 6d. (22.) 54. (23.) 1 lb. 4 oz. (24.) 10s. $8\frac{3}{4}$d. $\frac{1}{2}$. (25.) 1s. $11\frac{1}{2}$d. $\frac{13}{23}$. (26.) £1, 0s. 10d. (27.) 29 gals. 3 qts. 2 gills, and the other 32 gals. 3 qts. 1 pt. 2 gills. (28.) $\frac{1}{20}$ gal.

LXII. (1.) 27 lds. 2 qrs. 5 bush. 3 gals. (2.) 4191 qrs. 6 bush. 1 pk. 1 gal. (3.) 28 lds. 3 pks. 1 gal. (4.) 1638 gals. (5.) 2 bush. $3\frac{144}{144}$ gals. (6.) 1 ld. 4 qrs. 5 bush. 2 pks. $1\frac{6}{8}$ gals. (7.) $1253\frac{1}{8}$ pks. (8.) 2 lds. 4 qrs. 3 bush. 2 pks. $\frac{4}{5}$ gal. (9.) $\frac{5}{7}$. (10.) $\frac{11}{18}$. (11.) £32, 0s. $4\frac{1}{2}$d. (12.) £13, 1s. $1\frac{3}{4}$d. $\frac{1}{2}$. (13.) £18, 0s. $11\frac{1}{2}$d. $\frac{1}{16}$. (14.) 13 cwts. 2 qrs. 12 lbs. (15.) £115, 1s. 3d. (16.) £1, 2s. $9\frac{1}{2}$d. $\frac{1}{7}$. (17.) 14 : 3. (18.) 1 ld. 6 bush. $5\frac{13}{14}$ gals., £5, 13s. $0\frac{1}{4}$d. $\frac{12}{29}$. (19.) 1 qr. 1 bush. $1\frac{8}{11}$ gals. (20.) 4 bush. 4 gals.

LXIII. (1.) 1 gal. 1 dr. 35 m. (2.) 287989 m. (3.) 14 gals. 3 pts. 5 drs. 38 m. (4.) 4 pts. 18 oz. 1 dr. 49 m. (5.) 2 pts. 2 oz. 5 drs. $53\frac{33}{35}$ m. (6.) 51200 m. (7.) $\frac{7}{1200}$. (8.) 3 pts. 8 oz. 4 drs. $34\frac{4}{7}$ m. (9.) 133 pts. 1 oz. $4\frac{1}{2}$ drs. (10.) 23 : 70. (11.) 7s. $6\frac{3}{4}$d. (12.) £10, 13s. $2\frac{1}{4}$d. (13.) 8 oz. $17\frac{8}{11}$ m.

LXIV. (1.) 1 m. 1532 yds. ; 1 m. 733 yds. 1 ft. 5 in. (2.) *1759 po. 3 yds. 1 ft. 6 in. ; 1578 po. (3.) 1 m. 4 fur. 18 po. 4 yds. 1 ft. 5 in. ; 1 m. 18 po. 5 yds. 6 in. (4.) 349091 in. ; 491777 in. (5.) 170424 in. ; 213773 in. (6.) 33 m. 17 po. 5 in. (7.) 5 fur. 34 po. 4 yds. 5 in. (8.) 173 m. 20 po. 2 yds. 1 ft. 11 in. (9.) 12 po. 2 yds. 1 ft. $3\frac{1}{15}$ in. (10.) 12 po. 1 ft. 3 in. + R 2 yds. 1 ft. 9 in. (11.) 2 m. 16 po. 3 yds. 2 ft. $8\frac{184}{187}$ in. (12.) 89 ch. 67 lks. ; 97 ch. 43 lks. (13.) 4900 lks. ; 6719 lks. (14.) 308 yds. ; 89 ch. $54\frac{6}{11}$ lks. (15.) 110 ch. ; 17 m. (16.) 247 ch. $3\frac{1}{5}$ lks. ; 1 ch. $4\frac{11}{44}$ lks. (17.) 7 ft. $9\frac{7}{18}$ in. ; 6 ft. $8\frac{11}{12}$ in. (18.) 2 ft. $3\frac{79}{144}$ in. ; 8 ft. $3\frac{3}{8}$ in. (19.) 3 ft. 2′ 9″ ; 5 ft. 4′ 10″. (20.) 4 ft. 7′ 5″ 4‴ ; 6 ft. 8′ 4″ 6‴. (21.) $3\frac{9}{14}$.

(22.) 5. (23.) $\frac{1}{4}$, $\frac{3}{4}$. (24.) 1 ft. $3\frac{3}{8}$ in. ; 3 yds. 2 in. (25.) $\frac{15}{88}$. (26.) $\frac{31}{88}$. (27.) 7 m. 5 fur. 35 po. 1 ft. $2\frac{2}{3}$ in. (28.) 2 m. 6 fur. 39 po. 2 yds. 1 ft. $6\frac{3}{4}$ in. (29.) 96 m. 7 fur. 39 po. 4 yds. 1 ft. $8\frac{5}{8}$ in. (30.) 414 ch. $28\frac{4}{5}$ lks. ; $96\frac{84}{125}$ lks. (31.) 3 ft. $3\frac{3}{8}$ in. (32.) 4 yds. 1 ft. 4 in. (33.) £4, 6s. (34.) £13, 14s. $11\frac{1}{4}$d. $\frac{1}{3}$. (35.) 10s. $1\frac{3}{4}$d. $\frac{1}{2}$. (36.) £1, 2s. $9\frac{9}{4}$d. $\frac{3}{4}$. (37.) £1, 7s. $5\frac{1}{4}$d. $\frac{3}{4}$. (38.) £3, 0s. $9\frac{3}{4}$d. $\frac{1}{6}$. (39.) $5\frac{1}{4}$ yds. (40.) 176 yds. (41.) $41\frac{1}{4}$ ft. (42.) 2156 yds. (43.) 160 ch. 50 lks. (44.) $\frac{987415}{89765} = 11$. (45.) 15 in. (46.) 15. (47.) 130 yds. 1 ft. $1\frac{2}{287}\frac{2}{287}$ in. (48.) 8s. $1\frac{3}{4}$d. $\frac{4}{11}\frac{3}{11}$. (49.) 46 yds. $10\frac{3}{8}$ in. (50.) 17 m. 238 yds. 1 ft. (51.) 825 yds. (52.) $133\frac{3}{4}$ in. (53.) 249 yds. 1 qr. 1 nl. $\frac{3}{4}$ in. ; 120 yds. (54.) $14\frac{3}{8}$ in. (55.) 2 qrs. $1\frac{3}{4}$ in. (56.) 3 qrs. 3 nls. $\frac{7}{8}$ in. (57.) 1955 yds. 1 qr. 2 nls. $1\frac{1}{2}$ in. (58.) 3 nls. + R $8\frac{7}{8}$ in. (59.) £3, 5s. $9\frac{1}{2}$d. $\frac{1}{2}$. (60.) 13s. $9\frac{3}{4}$d. (61.) $33\frac{3}{4}$ yds. (62.) £3, 13s. 6d. ; 10 suits ; 1 yd. left.

LXV. (1.) 306755 sq. yds. (2.) 595704 sq. yds. (3.) 51653 sq. in. (4.) 66607 sq. ft. (5.) 24334527 sq. in. (6.) 549 sq. yds. 5 sq. ft. 122 sq. in. ; 321 sq. yds. 5 sq. ft. 28 sq. in. (7.) *12794 ac. 3 ro. 33 po. 27 sq. yds. 6 sq. ft. 108 sq. in. (8.) 8453 ac. 3 ro. 1 po. 3 sq. yds. 6 sq. ft. 108 sq. in. ; 1430 ac. 2 ro. 18 po. 22 sq. yds. 8 sq. ft. 72 sq. in. (9.) 155 ac. 2 ro. 36 po. 3 sq. yds. 2 sq. ft. 5 sq. in. ; 7744 sq. yds. (10.) 99 sq. ch. 3750 sq. lks. ; 1 ac. 2 ro. 32 po. (11.) 47 ac. 1 ro. 13 po. 24 sq. yds. 2 sq. ft. 36 sq. in. (12.) 3 ro. 1 po. 25 sq. yds. 1 sq. ft. 36 sq. in. (13.) 117 ac. 2 ro. 27 po. 24 sq. yds. 2 sq. ft. 36 sq. in. (14.) 6 ac. 34 po. 20 sq. yds. 7 sq. ft. 110 sq. in. (15.) 1 ac. 1 ro. 18 po. 22 sq. yds. 2 sq. ft. $126\frac{2}{3}$ sq. in. (16.) 20 po. 17 sq. yds. 1 sq. ft. 37 sq. in. + R 141 sq. in. (17.) 21 ac. 1 ro. 17 po. 23 sq. yds. 2 sq. ft. 36 sq. in. (18.) *8 sq. yds. 8 sq. ft. (19.) *28 sq. yds. 8 sq. ft. (20.) 3 sq. yds. 6 sq. ft. 48 sq. in. ; 10 sq. yds. 6 sq. ft. 48 sq. in. (21.) 116 sq. yds. 7 sq. ft. 24 sq. in. ; 10 sq. yds. 3 sq. ft. 108 sq. in. (22.) *6 sq. ft. 43 sq. in. (23.) *5 sq. ft. 54 sq. in. (24.) 9 sq. ft. 95 sq. in. ; 3 sq. ft. $40\frac{6}{12}$ sq. in. (25.) 7 sq. ft. $29\frac{1}{4}$ sq. in. ; 4 sq. ft. $40\frac{89}{144}$ sq. in. (26.) *8 sq. ft. 11′ 8″. (27.) *8 sq. ft. 4′ 4″. (28.) 4 sq. ft. 2′ 4″ 6‴ ; 5 sq. ft. 7′ 1″ 9‴. (29.) 4 sq. ft. 6′ 1″ 10‴ ; 5 sq. ft. 8′ 3″ 5‴ 4″. (30.) *13 sq. ft. 7′ 7″ 6‴. (31.) *5 sq. ft. 9′ 5″ 6‴

8″. (32.) 21 sq. ft. 10′ 10″ ; 10 sq. ft. 4′ 10″. (33.) 20 sq. ft. 11′ 1″ 11‴ 3″ ; 2 sq. ft. 10′ 3″ 5‴ 7″ 10′ 1″. (34.) 3 ac. 2 ro. 8 po. (35.) 2904 sq. yds. ; 2420 sq. ft. (36.) 22 sq. yds. 6 sq. ft. 27 sq. in. ; 25 sq. yds. 8 sq. ft. 51$\frac{3}{4}$ sq. in. (37.) $\frac{2}{25}$. (38.) $\frac{4}{45}$. (39.) 2$\frac{1}{3}$ times. (40.) 4 sq. ml. 510 ac. 39 po. 6 sq. ft. 108 sq. in.. (41.) 596 sq. ml. 553 ac. 0 ro. 23 po. 18 sq. yds. 8 sq. ft. 22$\frac{1}{2}$ sq. in. (42.) 2 ac. 10 po. 17 sq. yds. 111$\frac{60}{65}$ sq. in. (43.) 13 : 11. (44.) £156, 9s. (45.) £37, 10s. 11$\frac{1}{2}$d. (46.) 13s. 8$\frac{3}{4}$d. $\frac{3}{4}$. (47.) £1, 2s. 6$\frac{1}{4}$d. (48.) 126 sq. ft. 60 sq. in. (49.) 19$\frac{16}{9}$ sq. yds. (50.) 132 sq. ft. ; 59 sq. ft. 117 sq. in. (51.) 720 sq. yds. 36 sq. in. (52.) 17 sq. yds. 1 sq. ft. (53.) 8 sq. ft. 36 sq. in. (54.) 61 sq. yds. 5 sq. ft. 120 sq. in. (55.) 12 ft. 4 in. (56.) 40 yds. 1 ft. (57.) 51$\frac{1}{4}$ yds. ; £16, 14s. 9d. (58.) £10, 5s. 10d. (59.) 74 sq. ch. 1150 sq. lks. (60.) 7 ch. 5$\frac{4}{7}$ lks. (61.) 4 ac. 2 ro. 8 po. (62.) £60, 7s. 6d. (63.) £45, 15s. (64.) 2916$\frac{3}{4}$. (65.) 1$\frac{1}{4}$. (66.) £281, 5s. (67.) 1 ac. 2 ro. 15 po. ; 3 ac. 30 po. ; 9 ac. 2 ro. 10 po. ; 38 ac. 1 ro. (68.) 13$\frac{4}{7}$ ac. (69.) A 36 ac., B 36 ro., C 36 po. (70.) £500.

LXVI. (1.) 4 cu. yds. 6 cu. ft. 653 cu. in. ; 210 cu. yds. 21 cu. ft. 543 cu. in. (2.) 440012 cu. in. ; 1634305 cu. in. (3.) 111 cu. yds. 14 cu. ft. 1200 cu. in. (4.) 10 cu. yds. 25 cu. ft. 1527 cu. in. (5.) 424 cu. yds. 20 cu. ft. 720 cu. in. (6.) 15178 cu. yds. 10 cu. ft. 747 cu. in. (7.) 441 cu. yds. 3 cu. ft. 1304 cu. in. (8.) 6 cu. yds. 1505$\frac{24}{25}$ cu. in. (9.) 1 cu. yd. 26 cu. ft. 1563 cu. in + R 204 cu. in. (10.) 21 cu. ft. 1162 cu. in. + R 6$\frac{1}{8}$ cu. in. (11.) 13$\frac{1}{12}$ cu. yds. (12.) $\frac{3}{40}$. (13.) $\frac{2}{3}$. (14.) 373$\frac{24}{25}$ cu. in. (15.) $\frac{1}{1710}$. (16.) 26 cu. yds. 372$\frac{8}{10}$ cu. in. (17.) 371 cu. yds. 2 cu. ft. 259$\frac{3}{10}$ cu. in. (18.) 21 cu. yds. 6 cu. ft. 1296 cu. in. (19.) £22, 12s. 10d. (20.) £30, 7s. 1d. (21.) £119, 13s. 1$\frac{3}{4}$d. (22.) 3 cu. ft. 288 cu. in. ; 5 cu. ft. 720 cu. in. ; 4 cu. ft. 636 cu. in. (23.) 7 cu. ft. 768 cu in. ; 4 cu. ft. 496 cu. in. ; 6 cu. ft. 655$\frac{5}{12}$ cu. in. (24.) 16 cu. ft. 3′ 2″ ; 4 cu. ft. 6′ 9″ 4‴. (25.) 5 cu. ft. 8′ 1″ 6‴ ; 6 cu. ft. 6′ 8″ 11‴ 6′. (26.) 5 cu. ft. 3′ 5″ 5‴ 9′′ ; 18 cu. ft. 3′ 10″ 9‴ 5′ 4′. (27.) 139 cu. ft. 0′ 10″. (28.) 8 cu. ft. 2′ 10″ 7‴ 10″ 10′ 8″. (29.) 88 cu. ft. 0′ 6″ 7‴ 11′′ 11′ 4″. (30.) 29 cu. ft. 9′ 7″ 10‴ 10′′ 8′. (31.) 103 cu. ft. 8′ 2″ 2‴ 5″ 2′ 4″. (32.) 133 cu. ft. 2′ 1″ 0‴ 5′′. (33.) 20 cu. yds. 4 cu. ft. (34.) 4

cu. ft. 864 cu. in. (35.) 17 cu. ft. 1200 cu. in. (36.) 15 cu. yds. 16 cu. ft. 1485 cu. in. (37.) 16 cu. yds. 17 cu. ft. 288 cu. in. (38.) 21 cu. yds. 5 cu. ft. 396 cu. in. (39.) 48 cu. ft. (40.) 2 cu. yds. 432 cu. in. (41.) 361 cu. yds. 3 cu. ft. (42.) 50 gallons. (43.) 1 ft. (44.) 1 ton 9 cwts. 1 qr. 5 lbs. 4 oz. (45.) 864. (46.) 237600 tons. (47.) 2 ft. $7\frac{1}{2}$ in. (48.) 10 ft.

LXVII. (1.) 27° 7′ 25″; 163005 seconds. (2.) 52° 15′; 60° 23′ 17″. (3.) 44° 42′ 17″; 158° 17′ 21″. (4.) 72°; 78° 45′. (5.) 3 right angles 30°; 2 right angles 81° 49′ $5\frac{5}{11}$″.

LXVIII. (1.) 111 d. 22 h. 8 m. 18 sec. (2.) 96306300 sec. (3.) 83809843 sec. (4.) 43 yrs. 184 d. 18 h. 56 m. (5.) 219 d. 19 h. 3 m. 7″ + R $2\frac{1}{8}$ sec. (6.) 6 yrs. 215 d. 20 h. 36 m. $39\frac{2}{11}$ sec. (7.) 18 yrs. 69 d. 21 h. 3 m. (8.) 501; R 2 h. 24 m. (9.) $654\frac{6}{11}$ m. (10.) $\frac{3}{200}$. (11.) 21 h. 20 m. (12.) 3 yrs. 249 d. (13.) £4, 11s. 8d. (14.) £2, 12s. $0\frac{2}{5}$d. $\frac{8}{9}$. (15.) £57, 13s. 9d. (16.) £465. (17.) 257. (18.) 392. (19.) 854. (20.) 18 m. 11 sec. past 12. (21.) 5376600 sec. (22.) 1 d. 6 h. 40 m (23.) 20 m. (24.) $7\frac{7}{8}$ h. (25.) 7.35 A.M. (26.) £5, 15s. $6\frac{2}{3}$d. $\frac{24}{73}$. (27.) 25 m. $42\frac{4}{7}$ sec. to 9 A.M.

LXIX. (1.) 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97. (2.) $2^2 \times 7^3$, $3^3 \times 11^2$, $2^3 \times 3^2 \times 5^2$, $2 \times 11^2 \times 13$, $2^3 \times 7^2 \times 11$. (3.) $3^3 \times 5^2 \times 7^2$, $2^2 \times 3^3 \times 5^4$, $3^3 \times 5 \times 7^2$, $2^4 \times 3 \times 7^2 \times 13^2$. (4.) $3^4 \times 5^2 \times 7 \times 11$, $2 \times 11^2 \times 17 \times 19$, $2^2 \times 3^4 \times 7 \times 11$, $3^3 \times 5 \times 7^2$. (5.) $2^2 \times 3^4 \times 7$, $3^2 \times 5^2 \times 11^2$, $7^2 \times 11^2 \times 13$, $11^2 \times 13^2 \times 29$. (6.) 1452, 2352. (7.) 126, 350. (8.) 84, 18.

LXX. (1.) *12. (2.) *16. (3.) *17. (4.) 7. (5.) 9. (6.) 8. (7.) 9. (8.) 49. (9.) 36. (10.) 1. (11.) 6 (12.) 18. (13.) 28. (14.) 56. (15.) 3. (16.) 1. (17.) 11. (18.) 9. (19.) 13. (20.) 23. (21.) 24. (22.) 1145. (23.) 18. (24.) 89. (25.) 1. (26.) 236. (27.) 73. (28.) 11. (29.) 52. (30.) 111. (31.) 3. (32.) 4. (33.) 6. (34.) 241. (35.) $*2^2 \times 5 \times 7 = 140$. (36.) $2 \times 3^2 \times 11 = 198$. (37.) $3^3 \times 5 \times 7 = 945$. (38.) Reduce to C. D.; find G. C. M. of the numerators, and under it place the

C. D., $\frac{33}{63}$, $\frac{2}{3}$. (39.) $540 = 2^2 \times 3^3 \times 5$. Arrange the prime factors as follows :—

$$\begin{cases} 1, 2, 4 \\ 1, 3, 9, 27 \\ 1, 5 \end{cases}$$

Multiply each number in the second line by each number in the first, and then each product by each number in the last line. 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 27, 30, 36, 45, 54, 60, 90, 108, 135, 180, 270, 540. (40.) 1, 7, 13, 49, 91, 169, 637, 1183, 8281.

LXXI. (1.) *36. (2.) *84. (3.) 336. (4.) 216. (5.) 3360. (6.) 26852. (7.) 188575. (8.) 118902. (9.) 38420. (10.) 127842. (11.) *72. (12.) *252. (13.) 2772. (14.) 2340. (15.) 630. (16.) 912. (17.) 144. (18.) 25200. (19.) 55419. (20.) 270270. (21.) 55440. (22.) 25200. (23.) 10080. (24.) 6300. (25.) 49680. (26.) 122100. (27.) $*2^3 \times 3 \times 5^2 \times 7^2 = 29400$. (28.) $2^3 \times 3^3 \times 7 \times 11^2 \times 13 = 2378376$. (29.) $2^2 \times 3^3 \times 5^2 \times 7^2 \times 11 \times 13 = 18918900$. (30.) Reduce to C. D.; find the L. C. M. of the numerators, and under it place the C. D. 77. (31.) 132.

LXXII. (1.) $*\frac{13}{15}$. (2.) $*\frac{13}{18}$. (3.) $\frac{138}{241}, \frac{121}{473}$. (4.) $\frac{71}{105}, \frac{7}{8}$. (5.) $\frac{17}{18}, \frac{11}{15}$. (6.) $\frac{1091}{1110}, \frac{7}{8}$. (7.) $\frac{411653}{2181107}, \frac{10}{19}$. (8.) $\frac{277}{281}, \frac{2428848}{4084405}$. (9.) $*\frac{8, 10, 9, 6}{12}$. (15.) $\frac{210, 180, 195, 204}{660}$.

(10.) $*\frac{32, 12, 35, 30}{40}$. (16.) $\frac{924, 792, 385, 882}{1386}$.

(11.) $\frac{12, 10, 15, 14}{18}$. (17.) $\frac{42, 36, 33, 10}{54}$.

(12.) $\frac{75, 100, 72, 40}{120}$. (18.) $\frac{3432, 5940, 3575, 4095}{12870}$.

(13.) $\frac{24, 42, 44, 25}{60}$. (19.) $\frac{81, 130, 48, 40, 150}{180}$.

(14.) $\frac{4000, 700, 110, 18}{10000}$. (20.) $\frac{294, 160, 270, 308, 175}{420}$.

(21.) $\frac{35}{36}, \frac{9}{10}, \frac{7}{8}, \frac{11}{25}, \frac{5}{12}, \frac{7}{30}$. (22.) $\frac{19}{20}, \frac{13}{25}, \frac{17}{20}, \frac{13}{40}, \frac{9}{40}, \frac{4}{30}, \frac{15}{16}$. (23.) $78\frac{4}{21}$; $278\frac{29}{36}$. (24.) $5\frac{23}{30}$; $49\frac{5}{8}$. (25.) $204\frac{1043}{1080}$; $2801\frac{61}{72}$. (26.) $\frac{11}{140}, \frac{11}{150}, \frac{41}{294}, \frac{237}{455}$. (27.) $2121\frac{41}{77}$, $67056\frac{11}{12}$. (28.) $2000\frac{7}{450}, \frac{73}{100}$. (29.) $11\frac{617}{1575}$, $31\frac{95}{105}$. (30.) $3\frac{21}{30}$, $8\frac{29}{30}$. (31.) $24\frac{1}{3}$, $9\frac{2}{3}$. (32.) $\frac{13}{385}, \frac{1}{15}$. (33.) $21\frac{34}{75}$, $47\frac{475}{504}$. (34.) $32\frac{7}{24}$. (35.) $361\frac{35}{81}$. (36.) Multiply

the N. by 2, and if the product be greater than the D., the fraction must be greater than one-half. 1st and 3d. (37.) 2d and 3d. (38.) $\frac{349}{409} = \frac{349 \times \frac{10}{409}}{409 \times \frac{10}{409}} = \frac{349 \times \frac{10}{409}}{10}$ $= \frac{8\frac{218}{409}}{10}$. Neglecting $\frac{218}{409}$, the required fraction is $\frac{8}{10}$. (39.) $\frac{15}{20}$. (40.) $\frac{10}{12}$.

LXXIII. (1.) 105. (2.) $3\frac{1}{3}$. (3.) $2\frac{1}{2}$. (4.) $2\frac{31}{35}$ hours, $43\frac{3}{7}$ miles from Edinburgh. (5.) £5, 6s. $2\frac{3}{4}$d. $\frac{1847}{1120}$. (6.) 15 cwts. 2 qrs. 12 lbs. 1 oz. $3\frac{9}{15}$ drs. (7.) £25, 4s. (8.) 12 oz. 411 grs. (9.) $\frac{3}{10}$. (10.) 432. (11.) 13s. $3\frac{1}{2}$d. $\frac{2}{11}$. (12.) 5 in. (13.) 12 ft. $10\frac{2}{7}$ in. (14.) 147 ac. 38 po. 17 sq. yds. 4 sq. ft. 72 sq. in. (15.) $\frac{4}{5}$. (16.) £850. (17.) 11d. (18.) $1206\frac{4}{7}$ oz. av. (19.) £63, 1s. $5\frac{1}{4}$d. $\frac{14}{15}$. (20.) £116, 6s. $1\frac{9}{4}$d. $\frac{4}{15}$. (21.) 42 farms, each containing 42 acres. (22.) 1d. (23.) 30 ft. (24.) 189. (25.) 2521. (26.) $8\frac{8}{29}$ days. (27.) $1\frac{13}{23}$ hours. (28.) $3\frac{15}{184}$. (29.) 5. (30.) $1\frac{13}{183}$. (31.) 60 miles. (32.) 252. (33.) $\frac{1}{7}$. (34.) 24 : 35. (35.) $2\frac{4}{10}$ days; $1\frac{13}{15}$ days. (36.) 35 men. (37.) £13, 15s. 6d. (38.) 1s. 6d. (39.) £2, 12s. 6d. (40.) £5, 12s. 6d. (41.) 15. (42.) £36, 17s. $1\frac{9}{4}$d. $\frac{4}{5}$. (43.) 82 times; 1 gill. (44.) 409 gals. (45.) 41 gals. (46.) $\frac{2255}{13314}$. (47.) £6, 2s. 5d. (48.) 19 cu yds. 15 cu. ft. 1536 cu. in. (49.) 80 yds. (50.) 6 d. 18 h. 45 m. (51.) 98° 10′ 8″; 8° 10′ 8″. (52.) $\frac{1}{3}$. (53.) £519, 15s. (54.) £450. (55.) $\frac{15}{267}$. (56.) After 2 minutes. (57.) $\frac{4}{27}$. (58.) 30 ft. $2\frac{6}{17}$ in. (59.) 288, 744. (60.) £875. (61.) 1 yard. (62.) $9\frac{1}{135}$ days. (63.) $\frac{13}{34}$ more. (64.) He forfeited £1, and lost every idle day 4s. He was therefore idle 5 days. (65.) Man's share 11s. $2\frac{2}{4}$d., woman's 3s. $2\frac{1}{2}$d., and boy's 11d. (66.) $461\frac{3}{17}$ grs. (67.) $23\frac{19}{27}$. (68.) £350, 14s. (69.) 74 ac. 1 ro.; A 110 days, B. 99 days, and C 90 days. (70.) 576 lbs. (71.) 1 cu. yd. 19 cu. ft. $753\frac{161}{216}$ cu. in. (72.) 11 st. 6 lbs. (73.) 16s. $4\frac{1}{4}$d. $\frac{5}{11}$. (74.) $2\frac{2}{9}$ days. (75.) $12\frac{855}{1112}$. (76.) 10 ft. $4\frac{2}{7}$ in. (77.) 5s. 10d. (78.) $\frac{109}{291}$. (79.) 88. (80.) $3468\frac{7}{9}$. (81.) 48. (82.) $5\frac{5}{11}$ minutes past 1. (83.) $27\frac{3}{11}$ minutes past 2. (84.) 8 minutes. (85.) $49\frac{1}{11}$ minutes past 3. (86.) 9 A.M. (87.) 8 men. (88.) $41\frac{7}{135}$, $48\frac{6}{13}$. (89.) £770; $4\frac{1}{2}$d. per £. (90.) 80 florins. (91.) He lost $\frac{2}{3} + \frac{5}{8}$ of $\frac{1}{3} \times \frac{3}{4} = \frac{7}{8}$. ∴ £133 = $\frac{1}{8}$, and he lost £931. (92.) £7, 17s. 6d. (93.) $5\frac{1}{4}$d., 9s. (94.) £28, 9s. $4\frac{3}{4}$d. $\frac{13}{17}$. (95.) $47\frac{59}{78}$ cu. ft. (96.) 12 cu. ft.

LXXIV. (1.) $\frac{7}{10} + \frac{6}{100} = \cdot76$, $\frac{9}{10} + \frac{1}{100} + \frac{1}{1000} = \cdot911$, $\frac{8}{100} + \frac{4}{1000} = \cdot084$. (2.) 7 tens, 6 units, 4 tenths, 5 hundredths; 8 hundredths, 7 thousandths; 1 hundredth, 9 thousandths, 1 hundred-thousandth. (3.) None. (4.) 4·5, 6·9, 45·3, 6·72, 7·4, 1·45, ·29, ·08. (5.) ·9, ·72, ·083, ·0017, 1·1, ·011, ·101, ·011. (6.) ·4, ·05, ·003, ·000006, 5·7. (7.) ·69, ·083, ·000143, ·000000000018, ·000000000000000547. (8.) *·345, ·003005, ·206017. (9.) 400·500001, 1502·500013, ·001001000001000011. (10.) *17, *170; ·19, 19. (11.) 8917, 891700; 1·89, 189. (12.) 6, 109, ·81. (13.) *8·9, *·89; ·64, ·064. (14.) ·006, ·0006; ·0016, ·000016. (15.) ·01037, ·001037; ·00450013, ·0000450013. (16.) *$\frac{1}{5}$, *$\frac{2}{25}$, $\frac{1}{125}$, $7\frac{1}{5}$, $2\frac{1}{4}$, $\frac{9}{40}$. (17.) $\frac{1}{625}$, $1\frac{21}{1000}$, $31\frac{7}{2000}$, $3\frac{24}{25}$, $\frac{22}{250}$, $39\frac{3}{5}$. (18.) $\frac{7}{50}$, $\frac{7}{500}$, $\frac{7}{5000}$, $\frac{13}{1250}$, $1\frac{13}{125}$, $10\frac{13}{1250}$. (19.) 1·45326, 1·4533, 1·453, 1·45, 1·5; ·89721, ·8972, ·897, ·9, ·9.

LXXV. (1.) *63·9913. (2.) 285·21044. (3.) 120·343-2123. (4.) 484·7673. (5.) 2·66949. (6.) 137·3853. (7.) 340·31941. (8.) 7287·12045. (9.) 99756·56691. (10.) 753·33258. (11.) 1096403·34804. (12.) 75333·33258.

LXXVI. (1.) *8·0322. (2.) *2·066. (3.) *·98951. (4.) 146·4927. (5.) ·18313. (6.) 682·317. (7.) ·82646. (8.) ·01236. (9.) 645·43329. (10.) ·00099. (11.) 63208·27854. (12.) 9·6003. (13.) 20·3847. (14.) 616·0077. (15.) 644-3·543. (16.) 1110·8889.

LXXVII. (1.) *42·84, *91·3. (2.) 7·32, ·02912. (3.) 4·536, ·4752. (4.) ·5817, ·00000108. (5.) 150·85, 309·96. (6.) 3·2627, 2310·5083. (7.) 9·11275, 20·8025. (8.) ·017-085, 3·013515. (9.) 1·030301, 14166·950625. (10.) 1·4641, 4·004001. (11.) ·001030301, 19·4481. (12.) 2·43183, ·300-699. (13.) 220·593. (14.) ·037. (15.) ·009. (16.) 129-703·7295. (17.) 133·3359. (18.) ·2145, 2·0401.

LXXVIII. (1.) *·0917, *9·17, *917. (2.) 9·957, 99·57, 995·7. (3.) ·02, 2000. (4.) 6·83, ·016. (5.) 446·1624, ·9863. (6.) 30·125, ·129631. (7.) ·028160, 2816·051437. (8.) ·087042, ·870429. (9.) 2·482342, 3·952432. (10.) ·009200, ·423537. (11.) 2·03676, ·98225. (12.) 4805·38-461, 14·10089. (13.) 3·3102, 1·7998. (14.) ·0039, ·0612.

LXXIX. (1.) *·6, *·16, *·048. (2.) 7·125, ·8, 2·75, 4·625, ·4. (3.) 6·1875, ·2384, ·30625, 13·3515625, 8·6875. (4.) 194·3173828125, 306·0008, 31·00496, 8·14. (5.) 33-

·515625, 2·25, 1·875. (6.) ·785, 3·05, 13·8. (7.) ·1, ·7, ·5. (8.) ·25, 6·768, 1·8. (9.) *·6, *·5, *·83, *·916, *·81. (10.) ·15, ·590, ·873, ·2027, ·6732. (11.) ·0594, ·61788, ·63837, ·66395, 1·20664. (12.) 1·512820, ·5540, 1·594, 2·095238, 4·40714285. (13.) 1·67196, 83·730. (14.) 51·3, ·372, ·4976303317535545023696682464 45. (15.) 12·428571, 1·16, 5·65476190.

LXXX. (1.) $*\frac{8}{9}$, $*\frac{137}{198}$, $*\frac{193}{450}$. (2.) $\frac{7}{9}$, $4\frac{1}{3}$, $16\frac{14}{99}$, $\frac{1}{45}$, $\frac{13}{9000}$. (3.) $16\frac{9}{1100}$, $\frac{553}{900}$, $6\frac{41}{60}$, $16\frac{402}{990}$, $2\frac{1}{600}$. (4.) $4\frac{17}{110}$, $\frac{251}{1998}$, $4\frac{49}{120}$. (5.) $1\frac{20}{21}$, $3\frac{68}{240}$, $\frac{57}{616}$. (6.) $6\frac{83}{140}$, $3\frac{25}{156}$, $39\frac{41}{66}$. The rule may be explained as follows :—Let S. = the series.

$$\begin{aligned} 100000\ \text{S.} &= 34671{\cdot}671671, \text{ \&c.} \\ 100\ \text{S.} &= \quad 34{\cdot}671671, \text{ \&c.} \\ \hline \therefore 99900\ \text{S.} &= 34637 \end{aligned}$$

$$\text{and S.} = \frac{34637}{99900}.$$

LXXXI. (1.) *32·985. (2.) 24·7200. (3.) 39·6404. (4.) 100·6988. (5.) 494·1609. (6.) 51·6967. (7.) 99572·1284. (8.) 49·5065. (9.) 10·8946. (10.) *28·803858767. (11.) *95·98741. (12.) 41·34071278. (13.) 612·227548980875713. (14.) 129·03066378. (15.) 236·621078910.

LXXXII. (1.) *11·6407. (2.) 4·1141 ; ·2325. (3.) 1·6030 ; ·0060. (4.) 8·4327 ; ·6654. (5.) ·01235 ; ·81318. (6.) ·000001. (7.) ·9878 ; 57·3030. (8.) 4·1533 ; 2·0875. (9.) *3·410526799. (10.) *1·13221130. (11.) ·00000455 ; 1·000000728. (12.) 45·2079648557 ; 3·84754282351914.

LXXXIII. (1.) *·296. (2.) *·06 ; *1·36. (3.) ·16 ; ·145. (4.) 5·28 ; 5·16. (5.) 3·691358024 ; 4·956228. (6.) ·123456790 ; 2·3691358024. (7.) ·528 ; ·11427. (8.) ·31826 ; 3·086580. (9.) *1·407 ; *1·382926. (10.) ·4 ; 6. (11.) ·074 ; ·6. (12.) 2 ; ·6. (13.) ·85189 ; ·5580853. (14.) ·99854 ; 1·00146. (15.) 1·10204 ; 1·23469. (16.) ·73770 ; 2·00840.

LXXXIV. (1.) ·15. (2.) 1·5125 (3.) 1·71$\dot{6}$. (4.) ·78$\dot{3}$. (5.) ·96875. (6.) ·49794. (7.) ·081819. (8.) 29·48390. (9.) 22·38582. (10.) ·29411..., ·76271..., 2·32558. (11.) 21·875. (12.) ·27393.... (13.) 1·6 days. (14.) ·75. (15.) 68·8882. (16.) 106·9464583. (17.) *13·75. (18.) ·001, ·12. (19.) *4. (20.) 9. (21.) 100·8. (22.) ·2; ·01$\dot{2}$. (23.) 1·3; 28.

LXXXV. (1.) *£·8197916; *·416. (2.) ·07541$\dot{6}$; ·619$\dot{4}$. (3.) ·4732142857; ·263811.... (4.) ·158730; ·48. (5.) ·16; ·033057.... (6.) ·6; ·384259; ·16962. (7.) *5s.; 15s.; 2s. 10$\frac{3}{4}$d. $\frac{1}{6}$; £6, 11s. 6d. (8.) £2, 9s. 8$\frac{3}{4}$d. $\frac{1}{25}$; *£3, 6s. 5$\frac{3}{4}$d. $\frac{8}{11}$; £1, 0s. 1$\frac{1}{4}$d. $\frac{3}{5}$. (9.) 10s. 5$\frac{1}{2}$d. $\frac{10}{33}$; *9s. 0$\frac{1}{2}$d. $\frac{7}{25}$; £1, 12s. 8d. (10.) £4, 4s. 7d.; 13s. 5$\frac{9}{4}$d. $\frac{3}{5}$; *£17, 4s. 5$\frac{1}{2}$d. $\frac{1}{3}$. (11.) £5, 15s. 6$\frac{1}{2}$d. $\frac{3}{5}$; £4, 7s. 4$\frac{1}{2}$d. $\frac{10}{11}$. £2, 9s. 1$\frac{9}{4}$d. $\frac{4}{11}$. (12.) 26 lbs. 3 oz. 5$\frac{31}{125}$ drs.; 4 oz. 4 dwts.; 4 gals. 1 qt. 1 pt. 2$\frac{2}{5}$ gills. (13.) 1 sq. po. 11 sq. yds. 6 sq. ft. 130$\frac{82}{250}$ sq. in.; 53′ 49$\frac{1}{5}$″; 1 ton 7 cwts. 12 lbs. 7 oz. 1$\frac{7}{5}$ dr. (14.) 1 oz. 3 drs. 1 scr. 13$\frac{1}{3}$ grs.; 1 yd. 2 ft. 3$\frac{7}{50}$ in.; 9 cu. ft. 1555$\frac{1}{5}$ cu. in. (15.) 3 yrs. 167 d. 18 h. 3 m. 38$\frac{2}{11}$ sec.; 1 cwt. 2 qrs. 23 lbs. 12 oz. 5$\frac{72}{125}$ drs.; 2 lbs. 9 dwts. 14$\frac{2}{5}$ grs. (16.) 10 gals. 1$\frac{1}{5}$ gills; 3 sq. ft. 103$\frac{31}{125}$ sq. in.; 18 cu. ft. 1382$\frac{2}{5}$ cu. in. (17.) 4 right angles; 63 d. 19 h. 5 m. 27$\frac{3}{11}$ sec.

LXXXVI. (1.) *7500 c.; *74000 c.; 890 decimes. (2.) 740 dimes; 1600 c.; 8910000 mils. (3.) 420 fl.; 1900 c.; 5000 mils. (4.) 51000 millim.; 1000 metres; 3000000 centim. (5.) 310 deciar.; 400 deciar.; 11000 centiar. (6.) 60 decist.; 500 decist.; 100 st. (7.) 500 centil.; 30000 decil.; 20000 lit. (8.) 11000 millig.; 210000 centig.; 510-000000 millig. (9.) *7 fr. 9 d. 6 c.; 87 fr. 6 c.; 83 fr. 2 d. (10.) $8, 9 d. 7 c. 6 m.; $4, 9 c.; $76, 4 d. 1 c. (11.) £7, 6 fl. 7 c. 3 m.; £8, 9 fl. 6 m.; £64, 1 c. (12.) 89 m. 7 decim. 6 centim. 1 millim.; 7 kilom. 6 hectom. 4 dekam. 2 m. 3 decim. 9 millim.; 1 myriom. 8 kilom. 7 hectom. 6 dekam. 4 m. 3 decim. 2 centim. 1 millim. (13.) 7 a. 6 deciar. 8 centiar.; 7 dekar. 6 a. 4 deciar. 2 centiar.; 4 hectar. 2 dekar. 8 a. 1 deciar. (14.) 87 st. 6 decist; 74 dekast. 9 st. 3 decist.; 40 dekast. 9 decist. (15.) 8 lit. 4

decil. 2 centil. ; 1 dekal. 7 lit. 6 decil. 4 centil. 2 millil. ; 1 kilol. 8 hectol. 9 dekal. 7 lit. 8 decil. 4 centil. 9 millil. (16.) 7 gr. 6 decig. 4 centig. 9 millig. ; 89 hectog. 7 dekag. 6 gr. 4 decig. 2 centig. ; 76 kilog. 9 gr. 1 decig. 2 centig. (17.) *8 fr. 19 c. ; *7 fr. 8 c. ; 80 fr. 60 c. (18.) $8, 96 c ; $76, 40 c. ; $700, 30 c. (19.) £89, 60 c. ; £70, 90 c. ; £9, 67 c. (20.) 89 m. 600 millim. ; 7 kilom. 600 m. ; 7 myriom. 3000 m. (21.) 7 a. 60 centiar. ; ·809 hectar. ; 7610 a. (22.) 4 st. 20 centist. ; 50 st. 60 decist. ; 4 dekast. 20 decist. (23.) 8 kilol. 100 lit. ; 790 kilol. 600 lit. ; 849 lit. 600 millil. (24.) 86 kilog. 100 gr. ; 7 kilog. 640 gr. ; 8 gr. 400 millig. (25.) 6 fr. 20 c. ; 31 fr. 9 c. ; 45 c. (26.) $81, 40 c. ; $960, 9·6 c. ; 61·4 c. (27.) £7, 64 c. ; £8, 64 c. ; £83, 10 c. (28.) 6 m. 830 millim. ; 711 m. 1 decim. ; 8030 met. (29.) 7 ares, ·1 deciar. ; 6 dekar. 10·3 deciar. ; 71 ares, 3 centiar. (30.) 3 st. ·3 decist. ; 3 st. 3 decist. ; ·33 st. (31.) 1 lit. 70 centil. ; 1 lit. 7 centil. ; 100 dekal. 7 lit. (32.) 7 dekag. 60 decig. ; 10 hectog. 7600 centig. ; 1 kilog. 89·763 dekag. (33.) *3·02 fr. ; 15·6 fr. ; 51·07 fr. (34.) $3·05, $119·003, $7·63. (35.) £3·25 ; £6·06 ; £3·25. (36.) 1·002 kilom. ; 3·1053 kilom. ; 1·030065 myriom. (37.) 31·2 ares ; 1·048 hectar. ; 340·7 ares. (38.) 1·108 st. ; 30·4 st. ; 10·01 st. (39.) 3000·003 lit. ; 2130·2 lit. ; 10·31603 kilol. (40.) 1130·5 dekag. ; 12·03 quintals ; 102·009 kilog.

LXXXVII. (1.) *2133 fr. 71 c. (2.) 8357 fr. 23 c. (3.) $923, 21 c. (4.) $484·335. (5.) £974, 9 fl. 4 c. 9 m. (6.) £14·4. (7.) 81 met. 1 decim. 6 centim. (8.) 108 hectom. 2 dekam. 3 m. (9.) 43 myriom. 7 kilom. 1 dekam. 4 m. 6 decim. 2 centim. 3 millim. (10.) 38 hectar. 5 a. 5 deciar. 2 centiar. (11.) 701 hectar. 5 dekar. 3 a. 5 deciar. 9 centiar. (12.) 77 dekast. 6 st. 8 decist. 7 centist. (13.) 315 st. 2 decist. (14.) 734 lit. 7 decil. 6 centil. 6 millil. (15.) 1278 hectol. 1 dekal. 8 lit. 3 decil. 7 centil. (16.) 1045 gr. 1 decig. 8 centig. 5 millig. (17.) 158 kilog. 8 hectog. 8 dekag. 8 gr. 9 decig. (18.) 2266 fr. 70 c. (19.) $13, 83 c. (20.) 67 quintals 92 kilog. 3 hectog. 3 dekag. 3 gr. 3 decig. 3 centig. $3\frac{1}{2}$ millig. (21.) 52 hectom. 1 dekam. 1 decim. 3 centim. $3\frac{1}{2}$ millim.

LXXXVIII. (1.) *230 fr. 94 c. (2.) 6 fr. 8 d. 6 c. (3.) $2. 95 c. (4.) $7·96. (5.) £45, 28 c. 6 m. (6.) 9 fl.

3 c. (7.) 8 m. 7 decim. 5 centim. (8.) 3 dekam. (9.) 23 dekar. 8 a. 3 deciar. 5 centiar. (10.) 60 hectar. 4 dekar. 6 ares. (11.) 1 lit. 4 decil. 9 centil. (12.) 5 kilol. 3 hectol. 8 dekal. 8 lit. (13.) 5 decig. 8 centig. 1 millig. (14.) 459 hectog. 4 dekag. 1 gr. 1 decig. 5 centig. 4 millig. (15.) 1 dekast. 7 st. 5 decist. 6 centist. (16.) 21 milliers 1 quintal 85 kilog. 7 hectom. 5 dekam. (17.) £199, 8 fl. 8 c. 5 m. (18.) 78 fr. 98 $\frac{7}{36}$ c. (19.) 7 fr. 70 c. (20.) 52 hectar. 9 dekar. 1 are 9 deciare 4 centiare. (21.) 21 met. 50 centim.

LXXXIX. (1.) *333 fr. 27 c.; 407 fr. 33 c.; 925 fr. 75 c. (2.) $1353, 24 c. 8 m.; $2029, 87 c. 2 m.; $6089, 61 c. 6 m. (3.) £830, 5 fl. 5 c.; £3203, 5 fl. 5 c.; £11865. (4.) 248 met. 6 decim. 1 centim. 6 millim.; 1243 met. 8 centim.; 524 met. 8 decim. 5 centim. 6 millim. (5.) 762 dekar. 8 ares 6 centiar.; 1248 dekar. 2 ares 2 deciar. 8 centiar.; 27738 dekar. 4 ares. (6.) 381 dekast. 8 st. 4 decist.; 1336 dekast. 4 st. 4 decist.; 1177 dekast. 3 st. 4 decist. (7.) 558 lit. 2 decil. 9 centil. 6 millil.; 62808 lit. 3 decil.; 29380 lit. 3 decil. 2 centil. 7 millil. (8.) 33888 gr. 5 decig. 9 centig. 6 millig.; 43571 gr. 5 centig. 2 millig.; 603770 gr. 2 decig. 9 centig. 2 millig. (9.) 66 quintals 4 myriog. 1 kilog. 8 hectog. 3 dekag. 3 gr. 3 decig. 3 centig. $3\frac{1}{3}$ millig. (10.) 166 fr. $8\frac{3}{8}$ c. (11.) 225 fr. 32 c. (12.) 561 fr. 60 c.

XC. (1.) *120 fr. 2 d. $0\frac{7}{8}$ c.; 80 fr. 1 d. $3\frac{1}{12}$ c.; 30 fr. $5\frac{7}{32}$. (2.) $21, 21 c. $1\frac{1}{3}$ m.; $17, 35 c. $4\frac{6}{11}$ m.; $3, 97 c. $7\frac{1}{12}$ m. (3.) £67, 5 fl. 5 c. $2\frac{1}{7}$ m.; £39, 4 fl. $5\frac{5}{12}$ m.; £8, 4 fl. 4 c. $4\frac{1}{66}$ m. (4.) 5 decim. 3 centim. $9\frac{1}{3}$ millim.; 9 centim. $7\frac{2}{25}$ millim.; 1 decim. 3 centim. $8\frac{24}{33}$ millim. (5.) 34 ares 1 centiar. $7\frac{1}{27}$ milliar.; 10 ares 2 deciar. $5\frac{1}{9}$ milliar.; 24 ares 8 deciar. 2 centiar. $3\frac{2}{37}$ milliar. (6.) 1 dekast. 6 st. 7 decist. 9 centist. + 1 decist. 2 centist.; 1 st. 5 decist. 9 centist. + 6 decist. 7 centist.; 1 st. 5 decist. 6 centist. + 4 st. 3 decist. 6 centist. (7.) 5 lit. 9 decil. 7 centil. 1 millil. + 7 centil. 6 millil.; 1 lit. 1 decil. 1 centil. 9 millil. + 3 decil. 1 centil. 9 millil.; 6 decil. 3 centil. 5 millil. + 4 decil. 9 centil. 2 millil. (8.) 1 dekag. 8 gr. 8 centig. 5 millig. + 5 millig.; 1 dekag. 5 gr. 7 centig. 1 millig. + 2 centig. 8 millig.; 1 dekag. 3 gr. 8 decig. 1 centig. 5 millig. + 4 centig. (9.) 7 hectog. 4 gr. 7 decig.;

1 kilog. 1 hectog. 7 dekag. 4 gr. 5 decig. ; 7 hectog. 9 dekag. 1 gr. 7 decig. 9 centig. 7 millig. + 6 decig. 7 centig. (10.) £1483, 6 fl. 5 c.. (11.) 1378 met. 4 millim. (12.) 2 dekal. 5 lit. 3 decil. $7\frac{9}{13}$ millil. (13.) 5 st. 2 decist. 5 centist. (14.) £3, 3 fl. 4 c. $7\frac{1}{13}$ m. (15.) Man's share $6, 38 c. $6\frac{2}{3}$ m. ; woman's share $3, 19 c. $3\frac{1}{3}$ m. (16.) Man's share $24, 8 c. $5\frac{5}{7}$ m. ; woman's share $8, 2 c. $8\frac{4}{7}$ m. ; boy's share $4, 1 c. $4\frac{2}{7}$ m.

XCI. (1.) 3. (2.) $4\frac{1}{3}$. (3.) $\frac{4}{7}$. (4.) $\frac{7}{11}$, (5.) ·64272. (6.) ·09912. (7.) $\frac{7}{15}$, $\frac{7}{12}$. (8.) 8 d. $5\frac{5}{7}$ c. ; 8 hectog. ; 8 hectol. 3 dekal. $3\frac{1}{3}$ lit. (9.) $16733\frac{1}{3}$ times. (10.) 36 quintals 10 kilog. 1 hectog. 5 dekag. 2 gr. (11.) 19 sq. met. 4 sq. decim. ; 9 sq. dekam. 62 sq. met. ; 13 sq. hectom. 67 sq. dekam. 82 sq. met. (12.) 25 cu. met. 440 cu. decim. ; 198 cu. dekam. ·536 cu. met. ; 161 cu. hectom. 298 cu. dekam. (13.) 171·36 hectar. (14.) 21 cu. decim. 952 cu. centim. (15.) 245 fr. 34 c. (16.) 6 kilol. 5 hectol. 5 dekal. 2 lit. (17.) 35 fr. 7 c. (18.) 21 m. $49\frac{1}{11}$ sec. past 12 noon. (19.) 416 fr. $66\frac{2}{3}$ c. (20.) 114 fr. 80·4 c. ; £18, 1 fl. 4 c. 1 m. ; $143, 36·15625 c.

XCII. (1.) *£17, 9 fl. 1 c. 7 m. ; £540, 8 fl. 7 c. 5 m. (2.) £9, 5 fl. 7 c. 3 m. ; £11, 5 fl. 4 c. 9 m. (3.) £25, 9 fl. 2 c. 9 m. ; £311, 8 fl. 7 c. 7 m. (4.) *£16, 15s. $7\frac{1}{2}$d. ; £250, 16s. $8\frac{1}{2}$d. (5.) £16, 1s. $2\frac{1}{2}$d. ; £25, 16s. 2d. (6.) £36, 15s. $7\frac{1}{2}$d. ; £160, 10s. $2\frac{1}{2}$d. (7.) *1258 fr. 90 c. ; 1281 fr. 90 c. ; 1257 fr. 92 c. (8.) *£3, 10s. 11d. ; 14s. 2d. ; £22, 4s. $9\frac{3}{4}$d. (9.) *$204, 80 c. ; $772, 47 c. ; $2191, 61·5 c. (10.) *£14, 1s. $1\frac{1}{2}$d. ; £31, 7s. $9\frac{3}{4}$d. ; £14, 0s. $8\frac{1}{2}$d. (11.) *50 yds. 10 in. (12.) *8 kilom. 2 dekam. 8 m. 4 decim. 3 centim. 2 millim. (13.) 11 tonnes 530 kilog. 9 hectog. 6 dekag. 5 gr. 6 decig. (14.) 10 lbs. 12 oz. 12 drs. (15.) 136·013. (16.) 5 lbs. 1 oz. 2 grs. (17.) 996·3 hectar. (18.) 42 ac. 32 po. 22 sq. yds. 5 sq. ft. 123 sq. in. (19.) 441 gals. 2 qts. (20.) 271·324... lit. (21.) 41·2844 cu. met. ; 112 cu. yds. 13 cu. ft. 304 cu. in. (22.) 7 fr. 58 c. (23.) 3s. 8d. (24.) 1 lb. 6 oz. 9 drs. (25.) 70·437 quintals per cu. met. (26.) 2489·054 grs. per sq. in.

XCIII. (1.) *12. (2.) $140\frac{4}{5}$, $264\frac{1}{2}$, $323\frac{132}{175}$. (3.) *20. (4.) $12\frac{1}{4}$, $16\frac{2}{3}$, $18\frac{2}{4}$, $23\frac{1}{3}$. (5.) *2000. (6.) 540, 680, 75. (7.) *240. (8.) 900. (9.) *240. (10.) 760. (11.) ·65565,

8·25282, 1·962074. (12.) 4·36972..., 8·27646.... (13.) 923·6. (14.) 316·9615384. (15.) 904·761904. (16.) 437·5. (17.) 1s., 4s., 5s., 8s., 6d., 1s. 3d., 1s. 8d. (18.) 1½d., 3d., 9d., 2d., 3¼d. $\frac{1}{4}$, 3½d. $\frac{3}{8}$. (19.) £64; £144, 10s. 1¼d. $\frac{39}{50}$; £26, 12s. 6¼d. $\frac{1}{8}$. (20.) 10, 50, 12½, 16⅔, 37½, 3⅓, 2½, 3$\frac{3}{7}$, 4$\frac{1}{7}$ per cent. (21.) 12½, 16⅔, 25, 33⅓, 50, 66⅔, 20$\frac{1}{6}$, and 29$\frac{1}{3}$ per cent. (22.) 6 %, 5½ %, 12½ %. (23.) £74, 11s. 8d. (24.) £750, 15s. (25.) 48 fr. 2 c.; £54, 6 fl. 4 c. 4$\frac{1}{5}$ m.; $26, 60·63 c. (26.) £2, 3s. 6½d. $\frac{7}{10}$; £2, 12s. 6½d. $\frac{1}{10}$. (27.) 45010.... (28.) 14792.... (29.) 38350.... (30.) 4·029 %. (31.) 3483.... (32.) £37, 10s. (33.) £66, 13s. 4d. (34.) £742, 10s. (35.) 6$\frac{3}{4}$ %.

XCIV. (1.) £19, 10s.; £31, 3s. 7¼d. $\frac{2}{5}$; £27, 1s. 3½d. $\frac{3}{4}$. (2.) £24, 2s. 7½d. $\frac{23}{200}$; £35, 10s. 6½d. $\frac{3}{5}$; £1, 18s. 4¾d. $\frac{3}{10}$. (3.) £9, 13s. 4½d. $\frac{1}{8}$. (4.) £652, 10s. (5.) £100 — £7, 10s. = £92, 10s. ∴ For every £92, 10s. worth of cargo £100 must be insured. £9400; £705.

XCV. (1.) *£22, 10s. 5½d. $\frac{3}{5}$. (2.) *£122, 19s. 4½d. $\frac{2}{5}$. (3.) £124, 18s. 9½d. $\frac{17}{20}$. (4.) £35, 13s. 11¾d. $\frac{7}{80}$. (5.) £115, 16s. 5½d. $\frac{43}{50}$. (6.) £222, 16s. 11½d. $\frac{87}{100}$. (7.) £136, 12s. 3½d. $\frac{19}{20}$. (8.) £213, 2s. 4¼d. $\frac{37}{50}$. NOTE.—The answers in the following exercises are usually given exactly, but in general it is sufficient to find them to the nearest farthing, and in the case of decimals correct to three places:— (9.) £3, 3s. 9½d. $\frac{459}{400}$. (10.) £5, 16s. 7½d. $\frac{1}{60}$. (11.) £283, 18s. 2¾d. $\frac{189}{100}$. (12.) £181, 6s. 6¾d. $\frac{7}{15}$. (13.) £282, 2s. 4½d. $\frac{1}{8}$. (14.) £2, 5s. 5¼d. $\frac{167}{240}$. (15.) £117, 14s. 4¾d. $\frac{19999}{36000}$. (16.) £8, 2s. 3½d.... (17.) £15, 11s. 2½d.... (18.) £23, 0s. 8¾d.... (19.) £3, 0s. 6d.... (20.) £5, 7s. 10½d.... (21.) £13, 18s. 9¼d. (22.) £7, 19s. 3d.... (23.) £26, 0s. 6¼d....

XCVI. (1.) *£300. (2.) *£380. (3.) £57, 2s. 10½d. ½. (4.) £259, 14s. 9½d. $\frac{59}{77}$. (5.) £600, 8s. (6.) £278, 1s. 11¾d.... (7.) £514, 4s. 4¾d.... (8.) £182, 8s. 5d.... (9.) £87, 1s. 9¼d.... (10.) £9, 1s. 11¾d.... (11.) £15, 18s. 2¼d.... (12.) £13, 8s. 11d. (13.) £447, 5s. 7¾d.... (14.) £2, 16s. 1¾d.... (15.) 10½d. (16.) £27, 10s.... (17.) £785, 7s. 8¼d....; £773, 18s. 8½d.... (18.) *6$\frac{3}{5}$. (19.) 10. (20.) 3½. (21.) 10. (22.) 4 %. (23.) 5 %. (24.) *4$\frac{4}{5}$ yrs. (25.) 8 yrs. (26.) 12 years. (27.) 33⅓ years. (28.) 8 months. (29.)

1 year 7⅓ months. (30.) £265, 10s. (31.) 10 %. (32.) £14, 13s. 8d.... (33.) £83, 4s. 11½d.... (34.) 7s. 11½d.... (35.) £1, 13s. 2½d.... (36.) £5, 12s. 2½d.... (37.) £2, 12s. 3½d.... (38.) £9, 19s. 7d....

XCVII. (1.) *£70, 18s. 7½d. (2.) £57, 2s. 4⅜d.... (3.) £34, 5s. 6½d.... (4.) £82, 10s. 6½d.... (5.) £169, 17s. 2d. (6.) 13s. 0½d. (7.) £285, 9s. 9d.... (8.) £785, 17s. 5½d.... (9.) £821, 1s. 6½d.... (10.) £934, 9s. 11d.... (11.) £47, 10s. 5d.... (12.) £193, 19s. 1½d.... (13.) £58, 0s. 0½d.... (14.) £166, 10s. 1½d.... (15.) *£8000. (16.) £83, 13s. 5½d.... (17.) £151, 1s. 0½d.... (18.) £400. (19.) £145, 3s. 10¾d....

XCVIII. (1.) *16⅔ %. (2.) *7s. (3.) *£6. (4.) 41⅔ %. (5.) 10 %. (6.) 1s. 5⅓d. ⅔. (7.) £3, 15s. (8.) 400 : 480 : : 95 : 114 %. ∴ Gain of 14 %. (9.) 98 : 105 : : 4d. : 4⅛d. 1/7. (10.) Loss of 10 %. (11.) The ratio of the prime cost to the selling price is 2 : 3. ∴ 2 : 3 : : 100 : 100 + gain %. 50 %. (12.) 28⅓ %. (13.) Gain = $\frac{5}{100}$ of 70 + $\frac{8}{100}$ of 60 + $\frac{10}{100}$ of 290 = 37$\frac{3}{10}$ lbs. at cost price. The supposed gain of 9 % = $\frac{9}{100}$ of 420 = 37$\frac{8}{10}$ at cost price. ∴ $\frac{5}{10}$ lb. at cost price = 2s., and 4s. × 112 = £22, 8s. (14.) 8¾d. 1/8. (15.) 20 %. (16.) 40 %. (17.) 11 fr. 59·2 c. (18.) $28.

XCIX. (1.) *£100, £80, £40. (2.) £181; £241, 6s. 8d.; £301, 13s. 4d. (3.) *£180, £120, £90. (4.) £325; £216, 13s. 4d.; £108, 6s. 8d. (5.) £2640, £1680. (6.) £9, 11s. 6½d. ⅔; £6, 7s, 8½d. 7/9; £19, 19s. 0¾d. 5/9. (7.) £112, £168, £210, £245. (8.) £160, 0s. 4d.; £240, 0s. 6d.; £440, 0s. 11d. (9.) Their shares are as £250 × 3 : £350 × 5 : £450 × 6 = 15 : 35 : 54. ∴ A's = £90, B's = £210, C's = £324. (10.) A and B. each £834, 2s. 3¾d. $\frac{51}{209}$; C £521, 6s. 5¼d. $\frac{122}{209}$; D £810, 18s. 11½d. $\frac{28}{209}$. (11.) £28, £16, £4. (12.) 403½ lbs. of sugar, 1836½ lbs. of water. (13.) Beef 1s. 1¾d., mutton 1s. 4½d., lamb 1s. 6d. (14.) 17$\frac{1}{10}$ gals. (15.) Chlorine 28·955 lbs., potassium 31·892 lbs., oxygen 39·151 lbs. (16.) £29, 1s. 2¼d.; £50, 5s. 10¾d.; £83, 7s. 7d.; £97, 0s. 3½d. (17.) A $227, 34 c.; B $363, 49 c.; C $909, 9 c. (18.) *2 : 3. (19.) *3 : 2. (20.) *2, 1, 5, 1; or 3, 2, 3, 5. (21.) 5 at 2s. 6d., 1 at 3s., 1 at 3s. 2d. (22.) 3, 3, 3, 11. (23.) 3, 3,

and 1 of water. (24.) $7\frac{1}{2}$ lbs. of each. The quantities are as 4, 1, 1. $30 \div 4 = 7\frac{1}{2}$, and $1 \times 7\frac{1}{2} = 7\frac{1}{2}$. (25.) $77\frac{1}{2}$, $11\frac{1}{2}$, $11\frac{1}{2}$. The quantities are as 7, 1, 1; $7 + 1 + 1 = 9$. ∴ Multiply 7, 1, 1 respectively by $11\frac{1}{2}$. (26.) 5, 1. (27.) 8, 1. (28.) The S. G. of the mass must be ·8, and consequently $1514\frac{2}{7}$ lbs. of cork must be added. (29.) $18\frac{2}{3}$. (30.) *5 months. (31.) 38 days. (32.) 3 months 10 days. (33.) 14 months.

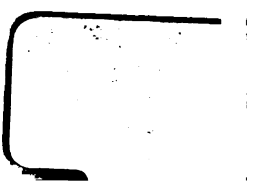
C. (1.) £1081, 1s. $7\frac{1}{4}$d. $\frac{3}{47}$. (2.) £952, 17s. $0\frac{3}{4}$d. $\frac{183}{403}$. (3.) £1887, 5s. $8\frac{3}{4}$d. $\frac{41}{163}$. (4.) £1040, 17s. 6d. (5.) £819, 3s. 9d. (6.) £538, 3s. $11\frac{1}{2}$d. $\frac{1}{5}$. (7.) £734, 3s. 9d. (8.) £924, 14s. $5\frac{1}{2}$d. (9.) £7050. (10.) £3975. (11.) £34, 10s. (12.) £155, 8s. $9\frac{1}{2}$d.... (13.) £89, 8s. $4\frac{1}{2}$d.... (14.) 4·41.... (15.) 2·59.... (16.) 60. (17.) £3 : £500 : : £$96\frac{3}{8}$: £16062, 10s. (18.) £$98\frac{5}{8}$ − £$96\frac{3}{8}$ = £$2\frac{3}{8}$. ∴ £$2\frac{3}{8}$ × 25 = £59, 7s. 6d. (19.) £$95\frac{1}{2}$: £$90\frac{3}{8}$: : £1500 : £1419·5.... (20.) £17, 7s. 4d.... (21.) £$90\frac{1}{2}$ gives £$2\frac{1}{2}$, and £95 : £$90\frac{1}{2}$: : £3 : £2·85. ∴ Better in the 3 per cents.

CI. (1.) 8 lbs. (2.) 234 fl. (3.) 5225 piasters. (4.) £22, 3s.... (5.) 6150 thalers. (6.) 25·5 fr. (7.) 25·51 fr.... (8.) *4s. 2d. (9.) 109 : 115·5 : : £22, 10s. : £23, 16s. 10d.... (10.) £22, 10s. : £560 : : 109·5 : $\$2725\frac{1}{2}$. (11.) ·58...%. (12.) 1·22...%. (13.) 25·3 fr. + 5 % on itself for the given time = 25·616....

CII. (1.) *79, 47, 97. (2.) *212, 341, 523, 702. (3.) 697, 7191, 8307, 9031. (4.) 78312, 69701, 413·21, 842·07. (5.) 10·031, 1·3719, 2·9618, ·11301. (6.) 13, ·23. (7.) 7, ·3. (8.) 1·870828, ·105356, ·033166, ·836660, ·264575. (9.) *19, 23, 17. (10.) 32, 29, 79, 117. (11.) 132, 113, 105, 189. (12.) 201, 203, 379, 371. (13.) 37·6, 11·02, 238·1, 1·376. (14.) 7, 9. (15.) 3, 1·1. (16.) 1·091392, ·584803, ·103228, 1·709975. (17.) $\sqrt{13\frac{1}{8}} = \sqrt{\frac{121}{8}} = \frac{11}{\sqrt{8}} = 3\frac{3}{4}$; $\sqrt{\frac{5}{8}} = \sqrt{\frac{5\times6}{6\times6}} = \sqrt{\frac{30}{36}} = \sqrt{30} \div 6 =$ ·91287; ·90453. (18.) $4\frac{3}{4}$, ·87358, ·91964.

CIII. (1.) 46 yards. (2.) $1963\frac{1}{2}$ sq. yds. (3.) $3\frac{1}{2}$ acres. (4.) 7 chains. (5.) $9\frac{1}{2}$ acres. (6.) 1·833... acres. (7.) 7 sq. ft. 9·878 sq. in. (8.) 12·23... in. (9.) 381·7044 cu. in. (10.) $\frac{1}{2}$ inch. (11.) 9314 sq. yds. 2 sq. ft. 18 sq. in.

(12.) 198 sq. yds. 4 sq. ft. 72 sq. in. (13.) 275 cu. yds. 18 cu. ft. 1296 cu. in. (14.) 200 ft. 6·4... in. (15.) 14 ft. 1.9... in. (16.) 10 ft. 7·6... in. (17.) 1·48 ft.

CIV. (1.) 10·11197. (2.) 924·352. (3.) $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} = \frac{1}{4}$. $\therefore$ 1 : 4. (4.) 3 m. $36\frac{2}{3}$ seconds before 12. (5.) ·004899. (6.) ·0000076. (7.) 24s. 18s.. 16s.. (8.) ·90. (9.) 10·63. (10.) 4 %. (11.) 75 : 115 : : 15 : 23s. (12.) 51·546599. (13.) 6s. 6d. ; £254, 9s. 6d. (14.) 20 months. (15.) 3·2336. (16.) 1. (17.) ·05. (18.) 3 minutes $24\frac{6}{11}$ seconds. (19.) 3 : 4 = 105 : 140, 5 : 6 = 140 : 168, and 7 : 8 = 168 : 192. $\therefore$ A : B : C : D : = 105 : 140 : 168 : 192. (20.) 90 : 91. (21.) ·05825.... (22.) ·76817.... (23.) 4 : 9. (24.) A 2s. 6d., B 1s. 6d., C 6d. (25.) A £195, 11s. $1\frac{1}{2}$d. $\frac{1}{3}$; B £35, 11s. $1\frac{1}{2}$d. $\frac{1}{3}$; C £8, 17s. $9\frac{1}{2}$d. $\frac{1}{3}$. (26.) 45 and 15. (27.) 7 minutes $9\frac{6}{11}$ seconds. (28.) $\frac{200+225+125}{3000} \times 100 = 18\frac{1}{3}$ %. (29.) $\frac{\frac{3}{5}+\frac{2}{5}+\frac{3}{4}}{12} \times 100 = 14\frac{7}{12}$ %. (30.) 8 %. (31.) $1\frac{7}{8}$ hours. (32.) £13068, 10s. (33.) 45 and 35. (34.) £19, 10s. $= \frac{3}{100}$ of O. P. $\therefore$ O. P. $= \frac{1}{8}$0 of £19, 10s. = £650. (35.) 4 months. (36.) 10 minutes before 2 o'clock. (37.) Lose $14\frac{2}{3}$ %. (38.) 5 cu. hectom. 281 cu. dekam. 527 cu. m. (39.) ·277056. (40.) 36·45. (41.) 15·3. (42.) 1 : ·908 : : 4250 : 3859 oz. (43.) $\frac{1}{6}$. (44.) $33\frac{1}{2}$ days. A and B are together in $\frac{6}{7}$ days, A and C in $\frac{6}{7}$ days, and the L. C. M. of $\frac{6}{7}$ and $\frac{6}{7} = 33\frac{1}{3}$. (45.) 40 days. (46.) 7. (47.) 36 minutes after 9. (48.) 3 : 2. (49.) 27 : 28. (50.) $580\frac{1}{3}$ yards. (51.) 300 miles. (52.) £450 at 5 %. (53.) £10, 15s. (54.) $12\frac{1}{2}$ %. (55.) $8\frac{8}{11}$ m. past 5, and $14\frac{2}{11}$ m. to 6. (56.) 176. (57.) 74. (58.) $71\frac{1}{2}$ days. (59.) Former ; $14\frac{2}{7}$ %. (60.) $11\frac{2}{3} : 1\frac{5}{9}$: : $173\frac{1}{3}$ h. Correct 9 P.M. April 6. (61.) £100 thus invested gives an income of $£3\frac{75}{84}$ or $£\frac{280}{84}$, and the difference is $£\frac{25}{84}$. $\therefore \frac{25}{84}$: 57 : : 100 : £5040. (62.) $58\frac{1}{2}$ yards. (63.) 353. (64.) 31·476. (65.) 63 : 19. (66.) 26, 26, 51. (67.) 16 %. (68.) 3 m. 57·6 sec. (69.) ·055559.... (70.) 182 fr. (71.) 133·3028... lbs. (72.) 4·68. (73.) G. 265, S. 32, A. 32. (74.) $2 \times 4 + 1\frac{2}{3} \times 8 = 21\frac{1}{3}$, $3 \times 7 + 4\frac{1}{2} \times 5 = 43\frac{1}{2}$. $\therefore$ Their shares of the profit are as $21\frac{1}{3} : 43\frac{1}{2}$. A's £209, 5s. $6\frac{9}{4}$d. $\frac{24}{889}$; B's £426, 14s. $5\frac{3}{4}$d. $\frac{865}{889}$. (75.) Cost price = 6s. per 100. $\therefore$ 6 : 100 : : $4\frac{1}{2}$: 75. (76.)

$37\frac{1}{2}$ years. (77.) £150, 14s. $0\frac{1}{2}$d.... (78.) $\frac{\frac{6}{13}\text{ of }\frac{11}{12}}{\frac{2}{3}\text{ of }\frac{1}{13}} \times 3\frac{1}{2} \times \frac{4749}{7000} = 21$ lbs. $14\frac{2208}{3125}$ oz. (79.) 2 ft. $3\frac{1}{6}\frac{2}{2}\frac{8}{5}$ in. (80.) $7 : 1 :: 8 : \frac{8}{7}$. $\therefore$ 6 lbs. $= \frac{1}{7}$ of a part, and the amount of tin = 48 lbs, and of brass 336 lbs. (81.) After the change there will be $3\frac{1}{2}$ parts of tin. Now if 7 parts contain 4 parts of tin, $\frac{7}{8}$ of a part will contain $\frac{1}{2}$ part of tin. $\therefore \frac{7}{8}$ of a part, or $\frac{1}{8}$ of the whole, must be taken away. (82.) $\frac{1}{2}$ hour. (83.) Hound runs 840 yds. in 1 minute $54\frac{6}{11}$ seconds. (84.) $178\frac{1}{4}$ tons. (85.) 17 d. 2 h. 45 m. (86.) The one will gain 45′ in $168\frac{3}{4}$ days. $6'' \times 168\frac{3}{4} =$ 16 m. $52\frac{1}{2}$ sec. = time gained by the one; $10'' \times 168\frac{3}{4}$ = 28 m. $7\frac{1}{2}$ sec. = time lost by the other. $\therefore$ They will shew respectively 5 h. 16 m. $52\frac{1}{2}$ sec., and 4 h. 31 m. $52\frac{1}{2}$ sec. (87.) 300 at 60 a penny brings 5d, and 300 at 50 a penny brings 6d. $\therefore$ If the sale of 300 make the difference of 1d., there must be 6300 nuts to make a difference of 1s. 9d. (88.) Each leap of the hare $= \frac{3}{4}$ of a leap of the hound, $\therefore$ 5 leaps of the hare $= 3\frac{3}{4}$ leaps of the hound, and 64 leaps of the one = 48 of the other. Now if the hound take 4 leaps to gain $\frac{1}{4}$ of a leap, it will take 768 leaps to overtake the hare. (89.) $100 + \frac{1760 \times 6 \times 15}{3600} = 144$ yds. passed over by train in 15″. $\therefore$ $115\frac{1}{2}$ yds. are passed over by train in 12″, and $15\frac{1}{2}$ yds. by person walking in the same time. Consequently he was walking at the rate of 2 m. 1040 yds. per hour. (90.) $\frac{8}{8}$ of c. p. = real s. p.; $\frac{7}{8}$ of c. p. $+ \frac{1}{4}$ of $\frac{7}{8}$ of c. p. = supposed s. p. $\therefore \frac{8}{8} - (\frac{7}{8} + \frac{1}{4}\text{ of }\frac{7}{8}) = 2$s. 6d. $= \frac{1}{32}$ of c. p. $\therefore$ c. p. = £4. (91.) $60 \times 4 =$ £240 = income at first. $\therefore \frac{£250 \div 2\frac{1}{2} \times 75}{60} =$ £125 = price of the 4 per cents. (92.) ·925 : 7·788 : : 200 : 1683 lbs. 14 oz. $4\frac{1}{37}$ drs. (93.) 3500 : 3276 : : 1 : ·936.